3GPP TSG CN Plenary Meeting #19 **NP-030110**
12th – 14th March 2003 Birmingham, UK.

Source: TSG CN WG4

Title: Small technical Enhancements and Improvements on SMS.

Agenda item: 8.8

Document for: APPROVAL

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
29.002	523	3	N4-030324	Rel-5	Clean-up of SMS procedures chapter	F	5.4.0
29.002	524	3	N4-030325	Rel-6	Clean-up of SMS procedures chapter	A	6.0.0

3GPP TSG CN WG4 Meeting #18 ***N4-030324***
Dublin, EIRE, 10th – 14th February 2003 **(Revision of N4-030291)**

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **523** ⌘**rev** **3** ⌘ Current version: **5.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Clean-up of SMS procedures chapter
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	19/02/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	Recent changes have cleaned up part of the SMS procedures chapter of TS 29.002. This has left a mixture of styles for both text and SDL diagrams. There are also several minor technical errors. Error corrections which are related to CAMEL handling, and which are therefore of specific interest to CN2, are on pages 24 (cf old version on pages 17 & 21) & 39 (cf old version on page 36)
Summary of change:	⌘	Redrawing of message flow diagrams and remaining SDL diagrams to improve layout. Editorial clean-up of text. Alignment of text with SDLs.
Consequences if not approved:	⌘	Several minor technical errors, and impaired readability

Clauses affected:	⌘	12.7; 23

		Y	N		
Other specs affected:	⌘		X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	

Other comments: ⌘ The pretence of MAP dialogues between the MSC and the VLR leads to unnecessary complexity in the SDL diagrams (handling for MAP_NOTICE and MAP_P_ABORT, possibility of protocol version dropback). This has been removed, as a small step in the right direction. The logical conclusion would be to follow the example of chapter 21, and completely remove the interworking between the MSC and the VLR from 29.002, but that would be a **much** bigger undertaking! A further logical consequence of this approach has been to remove the possibility of transferring an IMSI as the Destination Reference in the

	(pseudo-) MAP_OPEN request which precedes the MAP_SEND_INFO_FOR_MT_SMS request. Instead, the IMSI is added as a parameter of the MAP_SEND_INFO_FOR_MT_SMS request in subclause 12.7. The removal of the handling for MAP_NOTICE and MAP_P_ABORT, and the possibility of protocol version dropback, from the interworking between the MSC and VLR has not been highlighted in the SDL diagrams. A text box has been added to each sheet of SDL which needs it, to state the convention for the source and destination of input and output signals. This has not been highlighted in the SDL diagrams. The ordering of returning a result or error indication to the requesting entity and reporting the outcome of SM delivery or submission to the gsmSCF has been systematically changed to put the reporting to the gsmSCF **after** the return of the result or error to the requesting entity; this reduces the delay in returning a result or error indication to the requesting entity. This change has not been highlighted in the SDL diagrams. The handling of protocol dropback in both the dialogue initiating entity and the dialogue responding entity has been updated to recognise the fact that the macros Receive_Open_Cnf and Receive_Open_Ind have a "Vr" exit to denote the use of an earlier version of the protocol than the one specified in this version of 29.002. The earlier version of 29.002 assumed that the only earlier version of the protocol was "V1". This change has not been highlighted in the SDL diagrams. The changes to the descriptions of the behaviour of the SGSN for MO SMS and the HLR for MT SMS are closely based on those proposed in CR 29.002-509r2, but they omit the specific handling to make SS call barring apply to SMS transfer in the PS domain. If both CR 29.002-524 and CR 29.002-509 are approved, CR 29.002-509 should be implemented **after** CR 29.002-524. The ordering of the subclauses in 23.3 (handling of MT SMS) has been changed to 23.3.1: SMS-GMSC; 23.3.2: HLR; 23.3.3: VMSC; 23.3.4: VLR; 23.3.5: SGSN, to reflect the sequence in which these entities are involved in handling MT SMS. To ease the readability of the change request, the re-ordering has been done without change marks, except in the subclause and figure numbering. The change marks reflect the changes to the content of each subclause.

****** First modified section ******

12.7 MAP-SEND-INFO-FOR-MT-SMS service

12.7.1 Definition

This service is used between the MSC and the VLR. The service is invoked by the MSC receiving a~~n~~ mobile terminated short message to request subscriber related information from the VLR.

The MAP-SEND-INFO-FOR-MT-SMS service is a confirmed service using the primitives from table 12.7/1.

12.7.2 Service primitives

Table 12.7/1: MAP-SEND-INFO-FOR-MT-SMS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
SM RP DA	M	M(=)		
IMSI	C	C(=)		
MSISDN			C	C(=)
User error			C	C(=)
Provider error				O

12.7.3 Parameter use

Invoke id
See definition in clause 7.6.1.

SM RP DA
See definition in clause 7.6.8. This parameter shall contain either an IMSI or an LMSI.

IMSI
See definition in clause 7.6.2. This parameter shall be present if the SM RP DA parameter contains an LMSI; otherwise it shall be absent.

MSISDN
See definition in clause 7.6.2.

User error
The following errors defined in clause 7.6.1 may be used, depending on the nature of the fault:

- Unknown subscriber;
- Unidentified Subscriber;
- Absent subscriber;
- Unexpected Data Value;
- Data Missing;
- Illegal subscriber;
- Illegal equipment;
- Subscriber busy for MT SMS;
- System Failure.

Provider error
For definition of provider errors see clause 7.6.1.

****** Next modified section ******

23 Short message service procedures

23.1 General

The short message service procedures are used to control both mobile originated and mobile terminated short message transfer.

Four procedures exist for short message services:

- mobile originated short message service transfer;
- mobile terminated short message service transfer;
- short message alert procedure;
- short message waiting data set procedure.

The following application context refers to a complex MAP user consisting of several processes:

- shortMessageGatewayContext.

This application context needs a co-ordinating process in the HLR. Additionally a ~~C~~co-ordinating process~~or has to be~~is ~~defined~~ needed for the mobile originated situation in the MSC, because the A_CM_SERV_REQ message does not distinguish between mobile originated short message transfer and the short message alert procedures.

NOTE: the A_CM_SERV_REQ message is not used for SMS over GPRS. The modelling is based on the assumption that the SGSN will trigger the appropriate process, according to whether an RP_MO_DATA or an RP_SM_MEMORY_AVAILABLE is received over the LLC layer.

23.1.1 Mobile originated short message service Co-ordinator for the MSC

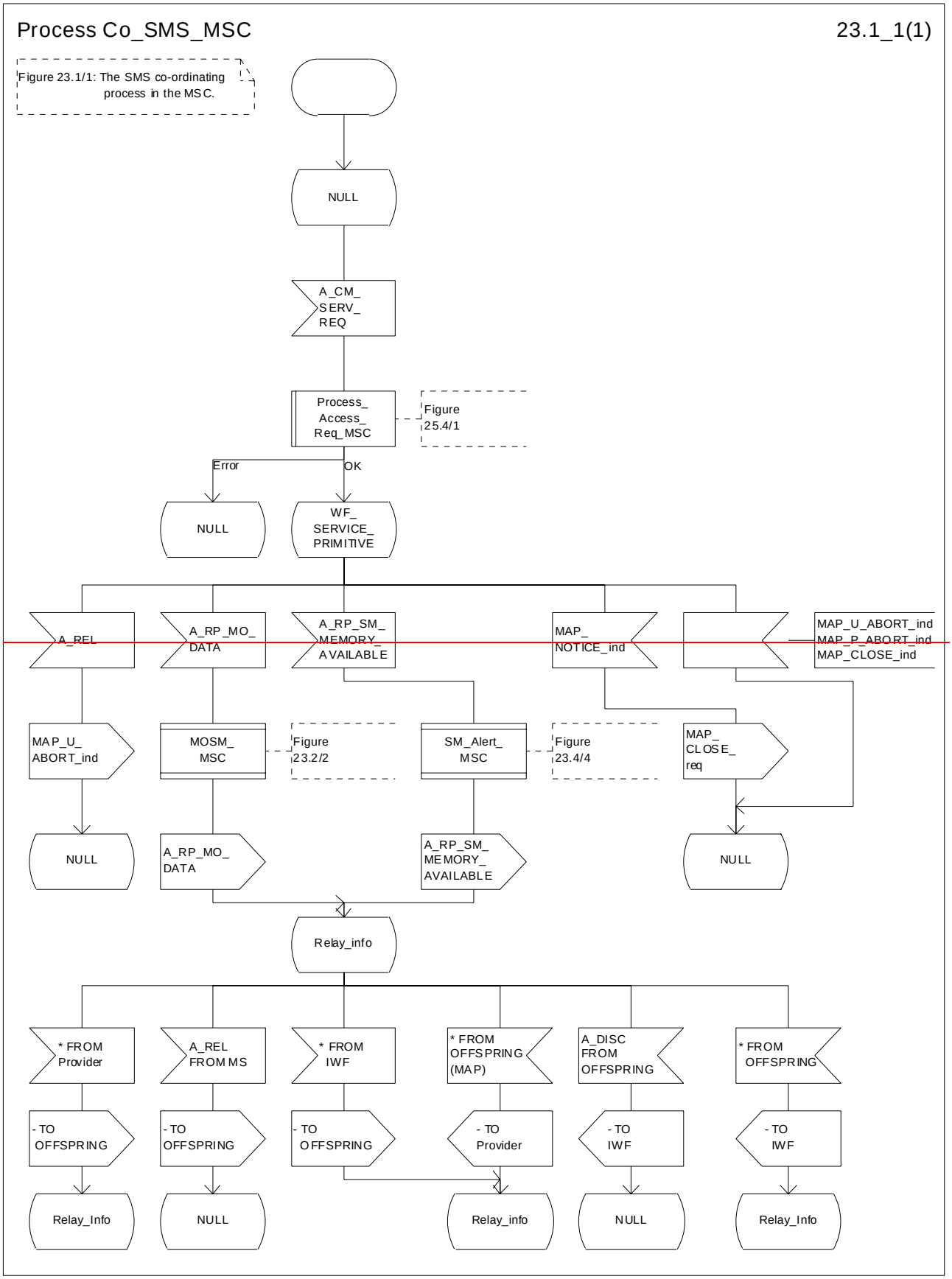
~~The~~ When the MSC receives an A_CM_SERV_REQ message (see 3GPP TS 24.008 [35]), with a CM service type indicating short message service, ~~is received~~ from the A-interface ~~containing the CM service type. This parameter indicates mobile originated short message service. The service~~, it invokes the macro Process_Access_Request_MSC to request the establisment of the CM connection. ~~MAP_PROCESS_ACCESS_REQUEST is started~~.

If the macro Process_Access_Request_MSC takes the "OK" exit (which means that the MSC has sent an A_CM_SERVICE_ACCEPT to the MS),~~MAP_PROCESS_ACCESS_REQUEST service ends successfully~~, the MS initiates mobile originated short message transfer or ~~alerting~~ sends an indication that it has memory available for more short messages. ~~Depending on the situation, t~~The MSC creates an instance of the appropriate process ~~is initiated~~ as follows:

- if the MSC receives an A_RP_MO_DATA indication ~~is received~~, it creates an instance of the process MO_SM_MSC ~~is initiated~~ (see subclause 23.2.1);
- if the MSC receives an A_RP_SM_MEMORY_AVAILABLE indication ~~is received~~, it creates an instance of the process SC_Alert_MSC ~~is initiated~~ (see subclause 23.4.1).

After it has created~~ion~~ the instance of the user process, the Co-ordinator relays the messages between the A-interface and the ~~invoked~~ child process and between the VLR and the child process until ~~a request or an indication for~~ the dialogue ~~termination~~ is terminated~~received~~.

The SMS ~~process~~ Co-ordinator process in the MSC is shown in ~~the~~ figure 23.1/1.


Process Co_SMS_MSC
23.1_1(1)
Figure 23.1/1: The SMS co-ordinating process in the MSC.
NULL
A_CM_ SERV_ REQ
Process_ Access_ Req_MSC
Figure 25.4/1
Error
OK
NULL
WF_ SERVICE_ PRIMITIVE
A_REL
A_RP_MO_ DATA
A_RP_SM_ MEMORY_ AVAILABLE
MAP_ NOTICE_ind
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
MAP_U_ ABORT_ind
MOSM_ MSC
Figure 23.2/2
SM_Alert_ MSC
Figure 23.4/4
MAP_ CLOSE_ req
NULL
A_RP_MO_ DATA
A_RP_SM_ MEMORY_ AVAILABLE
NULL
Relay_info
* FROM Provider
A_REL FROM MS
* FROM IWF
* FROM OFFSPRING (MAP)
A_DISC FROM OFFSPRING
* FROM OFFSPRING
- TO OFFSPRING
- TO OFFSPRING
- TO OFFSPRING
- TO Provider
- TO IWF
- TO IWF
Relay_Info
NULL
Relay_info
NULL
Relay_Info

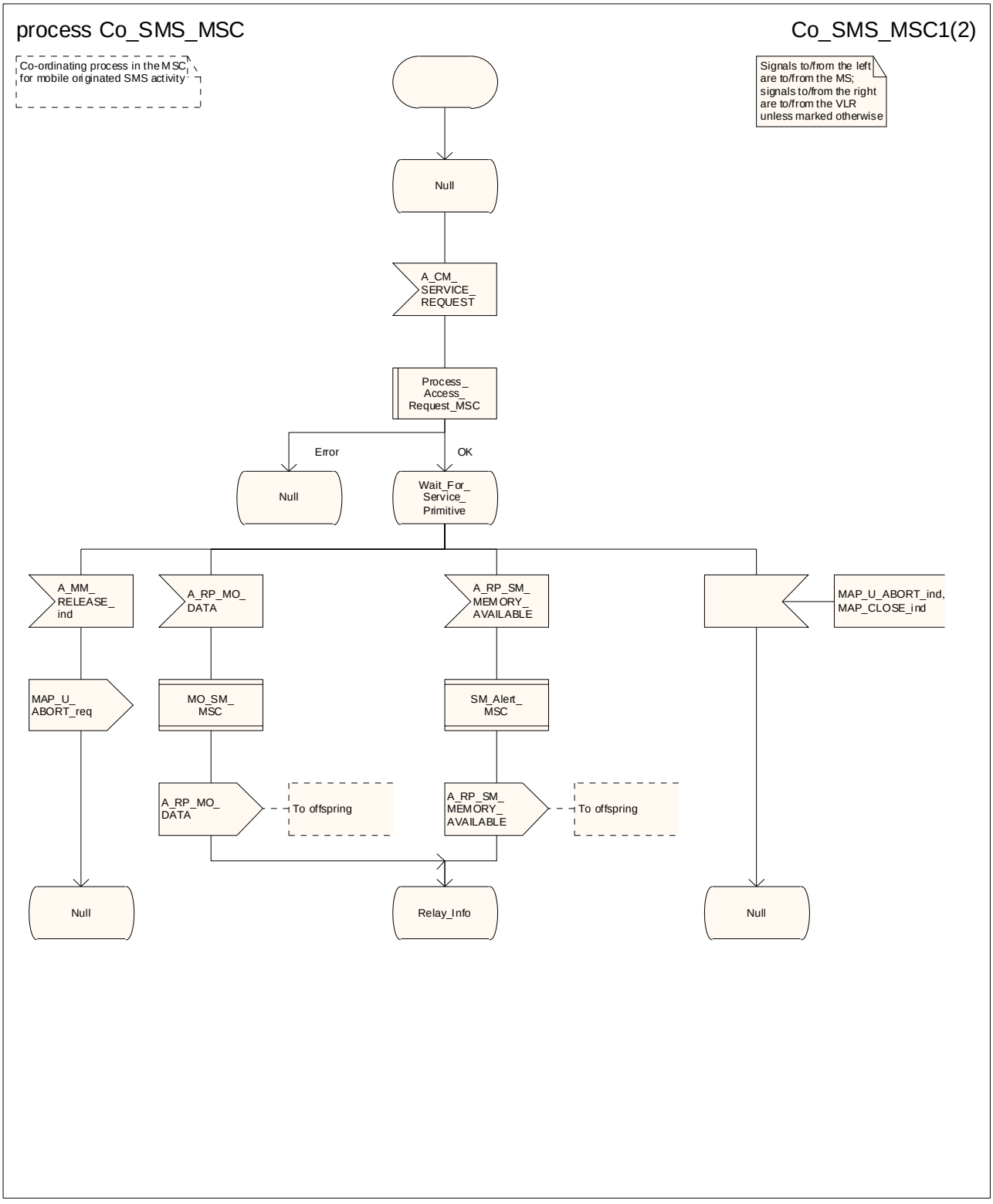


Figure 23.1/1 (sheet 1 of 2): Process Co_SMS_MSC

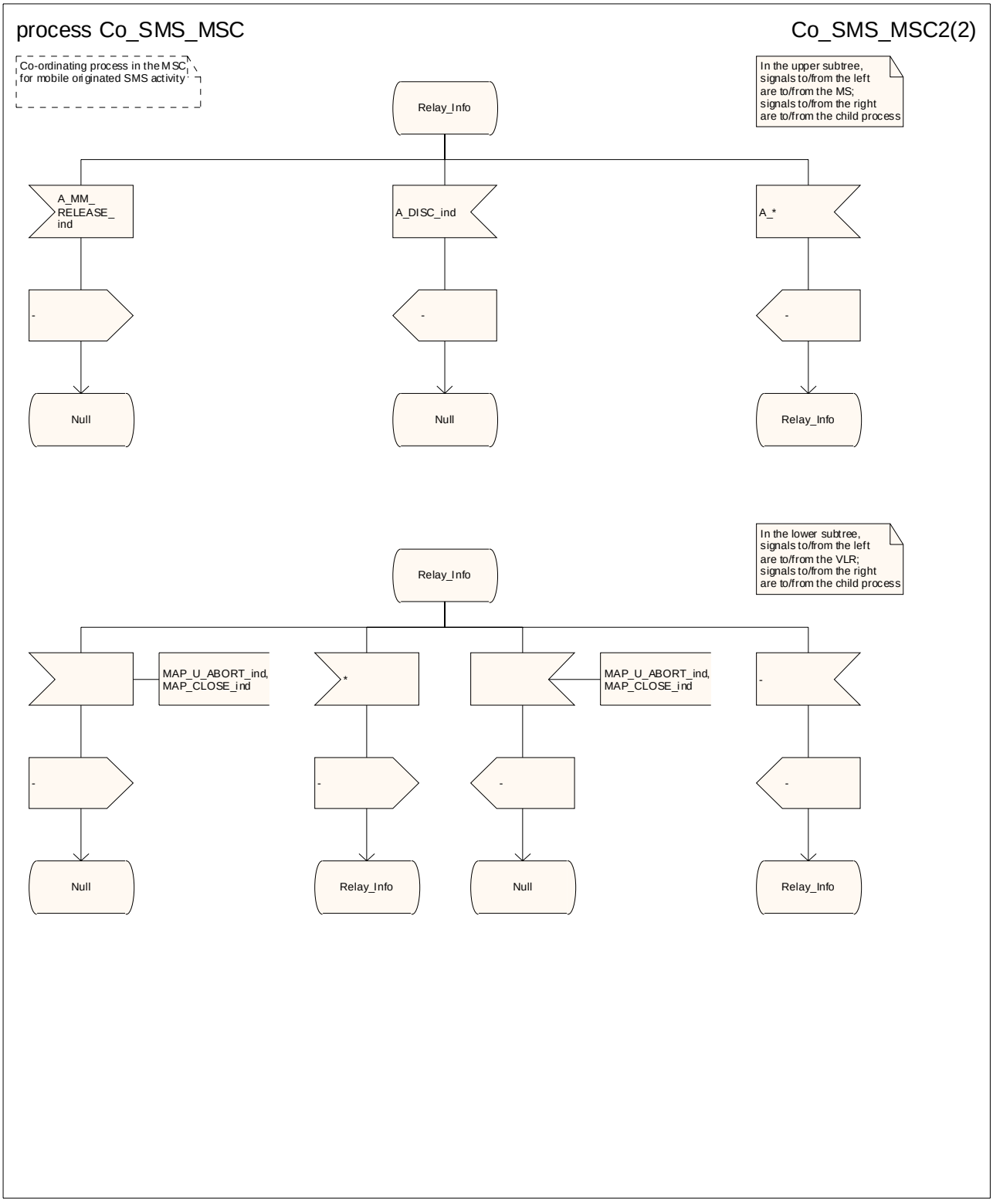


Figure 23.1/1 (sheet 2 of 2): Process Co_SMS_MSC

23.1.2 Short message Gateway Co-ordinator for the HLR

The process is started when the HLR receives a MAP_OPEN indication ~~opens a dialogue for the short message procedure between the gateway MSC and the HLR when~~using the application context shortMessageGatewayContext ~~is received~~. If ~~that service~~the dialogue opening is successful, the Co-ordinator can receive the first service primitive from the MAP ~~–~~ Protocol Machine. ~~Depending on the received primitive,~~ The HLR creates an instance of the appropriate ~~user~~ process ~~is created~~ as follows:

- if the HLR receives a MAP_SEND_ROUTING_INFO_FOR_SM indication ~~is received~~, it creates an instance of the process Mobile_Terminated_SM_HLR ~~is created~~;
- if the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication ~~is received~~, it creates an instance of the process Report_SM_delivery_stat_HLR ~~is created~~.

After it has created~~ion~~ the instance of the user process, the Co-ordinator relays the messages between the MAP ~~–~~ Protocol Machine and the ~~invoked~~ child process until ~~a request or an indication for~~the dialogue ~~termination~~ is terminated~~received~~.

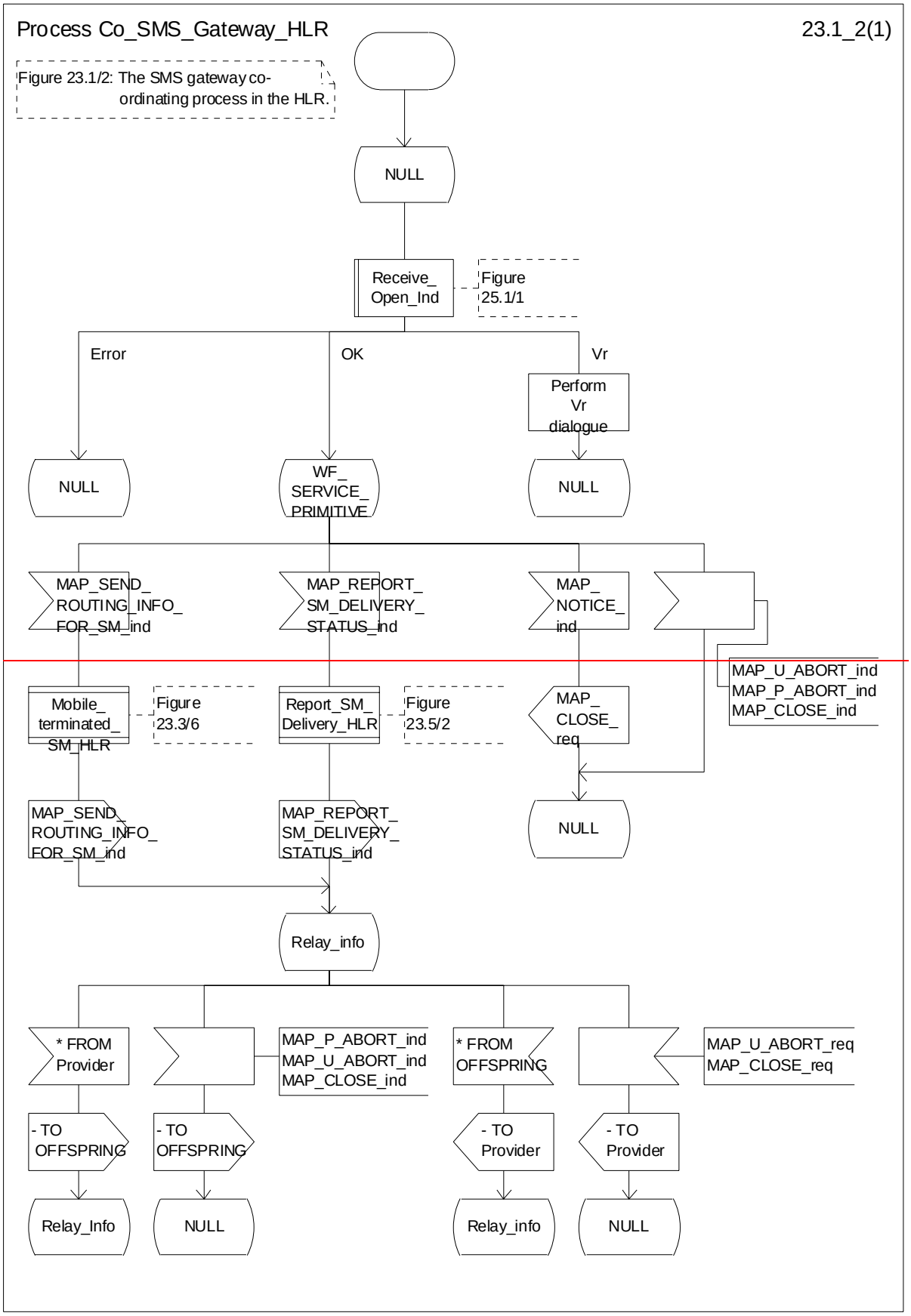
The SM Gateway Co-ordinator process in the HLR is shown in ~~the~~ figure 23.1/2.

If the Receive_Open_Ind macro takes the Vr exit then HLR shall perform the MAP ~~Vr~~ dialogue as specified for the appropriate application context version. ~~But based~~ Depending on the subscriber data, handling at the MAP user application level may be performed as ~~described in~~ specified in subclauses 23.3.2 and 23.5.1 of the present document~~release 97~~:

~~— If the subscriber is not a GPRS subscriber then the behaviour of the HLR shall be the same as described in the corresponding MAP Vr release.~~

~~— If the subscriber is a GPRS subscriber and a non GPRS subscriber with the option « transfer of SM via the MSC when GPRS is not supported in the GMSC » then the behaviour of the HLR shall be the same as described in the corresponding MAP Vr release.~~

~~— If the subscriber is a GPRS subscriber and a non GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only then the behaviour of the HLR shall be the same as for the case transfer over GPRS described in MAP release 97, with the following precision: because GMSC does not support MAP release 97, the previous MAP protocol release is used. When the HLR sends the MAP_SEND_ROUTING_INFO_FOR_SM_Resp, the SGSN number is mapped to the MAP parameter « MSC number ». When the HLR sends the MAP_INFORM_SERVICE_CENTRE_resp, the MNRG status shall be mapped to the MAP parameter « mnrf set ». When the HLR receives the MAP_REPORT_SM_DELIVERY_STATUS_Ind, it shall interpret the delivery outcome as a GPRS delivery outcome.~~


Process Co_SMS_Gateway_HLR
23.1_2(1)
Figure 23.1/2: The SMS gateway co-ordinating process in the HLR.
NULL
Receive_ Open_Ind
Figure 25.1/1
Error
OK
Vr
Perform Vr dialogue
NULL
WF_ SERVICE_ PRIMITIVE
NULL
MAP_SEND_ ROUTING_INFO_ FOR_SM_ind
MAP_REPORT_ SM_DELIVERY_ STATUS_ind
MAP_ NOTICE_ ind
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
Mobile_ terminated_ SM_HLR
Figure 23.3/6
Report_SM_ Delivery_HLR
Figure 23.5/2
MAP_ CLOSE_ req
MAP_SEND_ ROUTING_INFO_ FOR_SM_ind
MAP_REPORT_ SM_DELIVERY_ STATUS_ind
NULL
Relay_info
* FROM Provider
MAP_P_ABORT_ind
MAP_U_ABORT_ind
MAP_CLOSE_ind
* FROM OFFSPRING
MAP_U_ABORT_req
MAP_CLOSE_req
- TO OFFSPRING
- TO OFFSPRING
- TO Provider
- TO Provider
Relay_Info
NULL
Relay_info
NULL

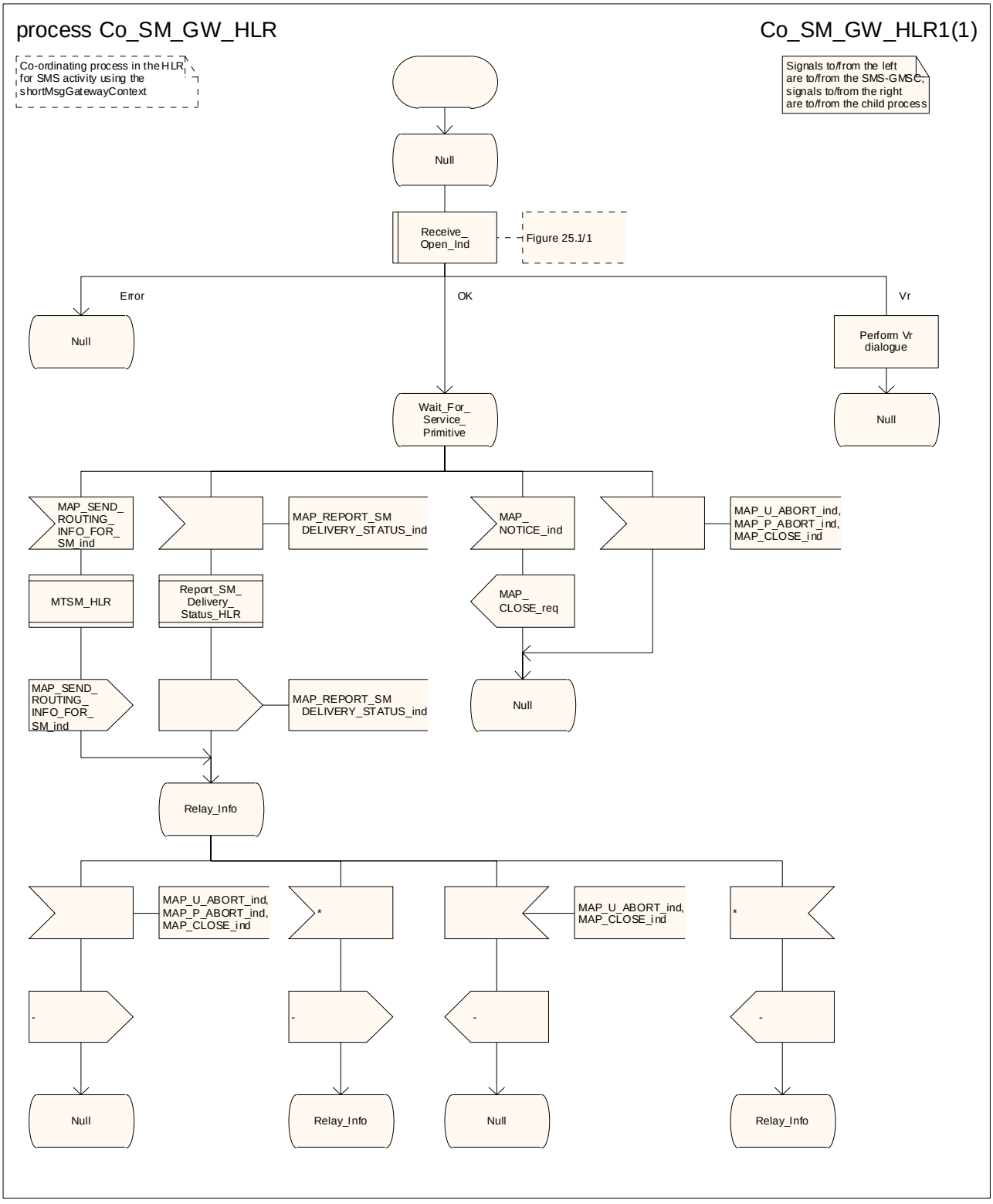


Figure 23.1/2: Process Co_SM~~S~~_Gateway_HLR

~~23.1.3 Mobile originated short message service Co-ordinator for the SGSN~~

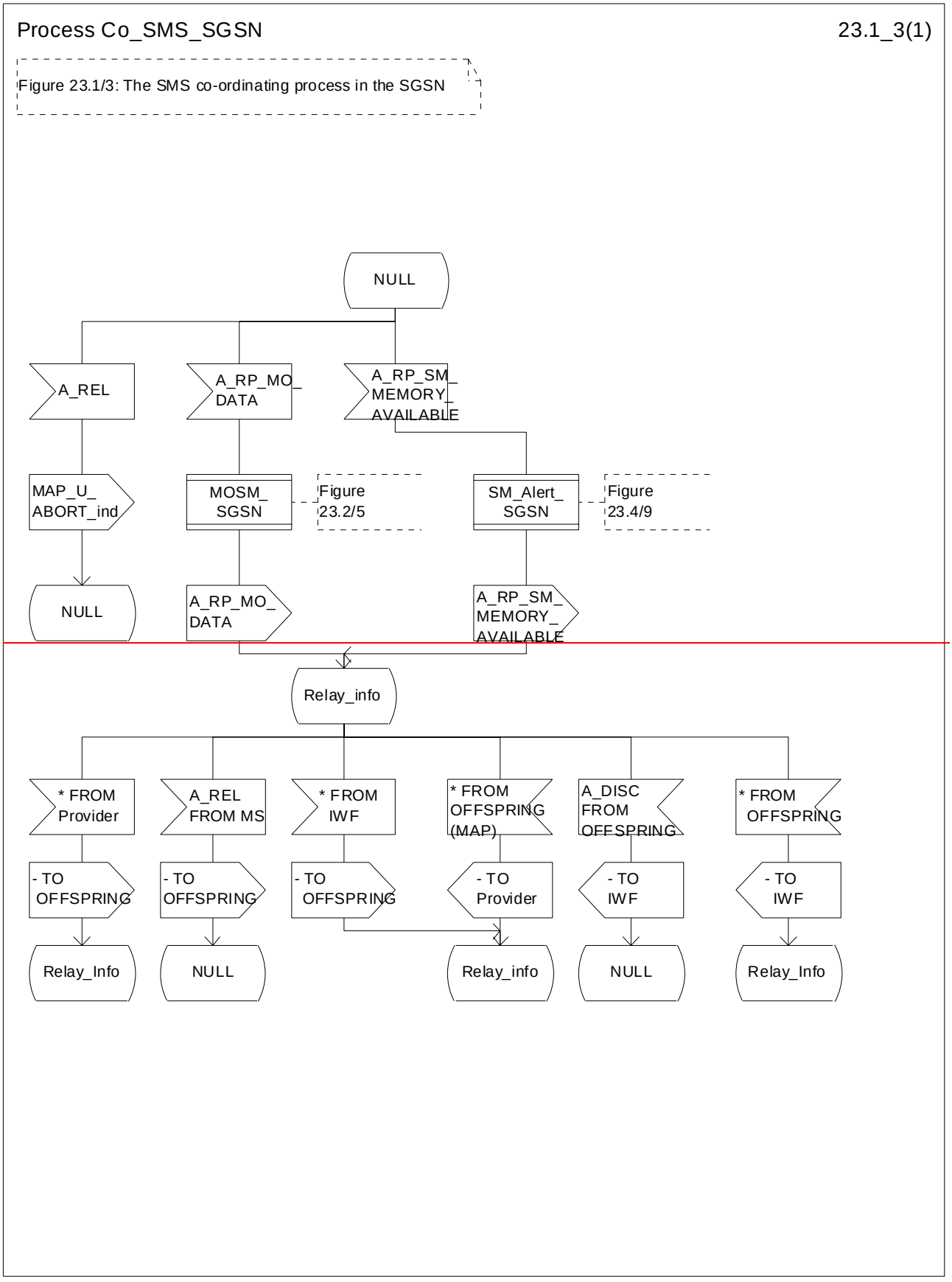
~~The MS initiates mobile originated short message transfer or alerting indication. Depending on the situation, the appropriate process is initiated as follows:~~

- ~~if the A_RP_MO_DATA indication is received, the process MOSM_SGSN is initiated (see clause 23.2.4);~~

- if the A_RP_SM_MEMORY_AVAILABLE indication is received, the process SC_Alert_SGSN is initiated (see clause 23.4.5).

After creation of the user process the Co-ordinator relays the messages between the SGSN and the MS, and the invoked process until a request or an indication for dialogue termination is received.

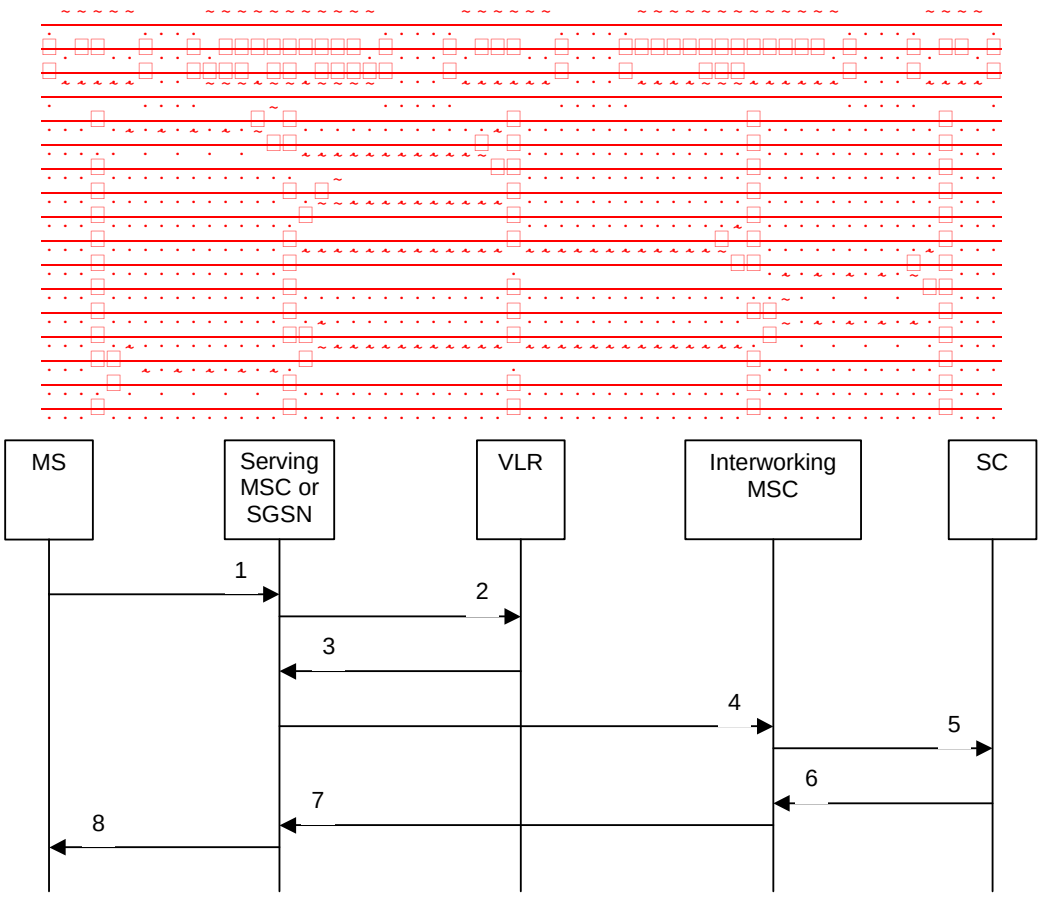
The SMS process Co-ordinator is shown in the figure 23.1/3.



~~Figure 23.1/3: Process Co_SMS_SGSN~~

23.2 The mobile originated short message transfer procedure

The mobile originated short message service procedure is used to forward a short message from a mobile subscriber to a Service Centre. The message flow for the mobile originated short message service procedure is shown in figure 23.2/1.



1) Short Message (3GPP TS 24.011 [37]).
2) MAP_SEND_INFO_FOR_MO_SMS (*).
3) MAP_SEND_INFO_FOR_MO_SMS_ACK (*).
4) MAP_MO_FORWARD_SHORT_MESSAGE.
5) Short message (3GPP TS 23.040).
6) Short message Acknowledgement (3GPP TS 23.040).
7) MAP_MO_FORWARD_SHORT_MESSAGE_ACK.
8) Short Message Acknowledgement (3GPP TS 24.011 [37]).
(*) Messages 2) and 3) are not used by the SGSN.

Figure 23.2/1: Mobile originated short message transfer

In addition the following MAP services are used:

MAP_PROCESS_ACCESS_REQUEST	(see subclause 8.3); (*)
MAP_AUTHENTICATE	(see subclause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see subclause 8.6); (*)
MAP_PROVIDE_IMSI	(see subclause 8.9); (*)
MAP_CHECK_IMEI	(see subclause 8.7);
MAP_FORWARD_NEW_TMSI	(see subclause 8.9); (*)
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see subclause 9.1); (*)
MAP_READY_FOR_SM	(see subclause 12.4).

(*) Th~~o~~se messages are not used by the SGSN.

23.2.1 Procedure in the serv~~ic~~ing MSC

~~The activation of the MAP_PROCESS_ACCESS_REQUEST service is described in the clause 25.4.1.~~

Any CAMEL-specific handling defined in this subclause is omitted if the MSC does not support CAMEL control of MO SMS, or if the subscriber ~~is not a~~does not have a subscription for CAMEL ~~subscriber~~control of MO SMS.

When the MSC receives~~ing~~ the short message from the A-interface, ~~the MSC~~it sends ~~the~~ a MAP_SEND_INFO_FOR_MO_SMS request to the VLR and waits for a response. While the MSC is waiting for the response from the VLR:

~~- if it receives a Release indication from the A-interface, it aborts the dialogue with the VLR, and the process terminates;~~

- if the VLR aborts or prematurely closes the dialogue, the MSC sends an A_RP_ERROR with error cause "Network out of order" to the MS, and the process terminates;

- ~~As a response~~if ~~the MSC~~ it~~will~~ receives ~~the~~ a MAP_SEND_INFO_FOR_MO_SMS confirmation from the VLR, it checks the confirmation.~~indicating that:~~

~~- the service ends successfully. If the MSC is not itself the IWMSC, the short message transmission towards the IWMSC is initiated using the MAP_MO_FORWARD_SHORT_MESSAGE request;~~

  - if the confirmation includes an error, the MSC sends an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;~~service ends unsuccessfully. The error cause in the MAP_SEND_INFO_FOR_MO_SMS confirmation indicates the reason for the unsuccessful end. The mapping between MAP error causes and RP_ERROR causes is described in 3GPP TS 23.140.~~

  - if the confirmation indicates a successful outcome, the MSC calls the procedure CAMEL_O_SMS_INIT and tests the result.

    - if the result was "SMS_Aborted", the process terminates;

    - if the result was "Release_SMS", the MSC returns an A_RP_ERROR with an error cause as instructed by the gsmSCF to the MS, and the process terminates;

    - if the result was "Redirect SMS", the MSC modifies the data for the submitted short message as instructed by the gsmSCF, and the MSC handling continues;

    - if the result was "Continue", the MSC handling continues.

  - the MSC checks whether Operator Determined Barring would prevent the submission of the short message.

    - if Operator Determined Barring would prevent the submission of the short message, the MSC returns an A_RP_ERROR with error cause "Operator determined barring" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates;

    - if Operator Determined Barring would not prevent the submission of the short message, the MSC handling continues.

  - the MSC checks whether SS barring would prevent the submission of the short message.

    - if SS barring would prevent the submission of the short message, the MSC returns an A_RP_ERROR with error cause "Call barred" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates;

    - if SS barring would not prevent the submission of the short message, the MSC handling continues.

  - if the MSC is separate from the SMS-IWMSC, MSC handling continues as described below under the heading "Serving MSC is separate from SMS-IWMSC".

  - if the MSC is also the SMS-IWMSC, the MSC handling continues as described below under the heading "Serving MSC is SMS-IWMSC";

Serving MSC is separate from SMS-IWMSC

The MSC checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.

- if the two requests can be grouped in a single TC message, the MSC requests a dialogue with the SMS-IWMSC, including the MAP_MO_FORWARD_SHORT_MESSAGE request;
  - if the dialogue opening is successful, the MSC waits for the response from the SMS-IWMSC;
  - if the macro Receive_Open_Cnf takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol and the process terminates;
  - if the macro Receive_Open_Cnf takes the "Error" exit, the MSC returns an A_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates.
- if the two requests cannot be grouped in a single TC message, the MSC requests a dialogue with the SMS-IWMSC, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;
  - if the dialogue opening is successful, the MSC sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the SMS-IWMSC, and waits for the response from the SMS-IWMSC;
  - if the macro Receive_Open_Cnf takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol, and the process terminates;
  - if the macro Receive_Open_Cnf takes the "Error" exit, the MSC returns an A_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates.
- if the MSC receives a MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the SMS-IWMSC, it checks the content of the confirmation;
  - if the confirmation indicates that the submission of the short message was successful, the MSC returns an A_RP_ACK to the MS and reports to the gsmSCF that the short message submission was successful, and the process terminates;
  - if the confirmation indicates that the submission of the short message failed, the MSC returns an A_RP_ERROR with the appropriate error cause to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates;
- ~~if the MSC receives a Release indication from the A-interface, it aborts the dialogue with the SMS-IWMSC and reports to the gsmSCF that the short message submission has failed, and the process terminates;~~
- if the dialogue with the SMS-IWMSC fails, the MSC returns an A_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates.

Serving MSC is SMS-IWMSC

The MSC sends an SC_RP_MO_DATA request to the Short Message Service Centre (SMSC), and waits for the response.

- ~~if the MSC receives a Release indication from the A-interface, it aborts the dialogue with the SMSC and reports to the gsmSCF that the short message submission has failed, and the process terminates;~~
- if the MSC receives an error response from the SMSC, it returns an A_RP_ERROR with the appropriate error cause to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates;
- if the SMSC aborts the dialogue, the MSC returns an A_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates;
- if the MSC receives a positive response from the SMSC, it returns an A_RP_ACK to the MS and reports to the gsmSCF that the short message submission was successful, and the process terminates.

~~If there are data errors in the MAP_SEND_INFO_FOR_MO_SMS confirmation, or there is an operation failure in MAP, the RP_ERROR cause network out of order is forwarded to the mobile station.~~

~~The MSC opens a CAMEL dialogue as specified in 3GPP TS 23.078. If the CAMEL service bars the MO SM then the failure is reported to MS.~~

~~The MSC checks the barring as follows;~~

- ~~if the short message transfer would contravene operator determined barring, the failure is reported to the CAMEL service as specified in 3GPP TS 23.078 and the call barred error with cause operator barring is returned to MS;~~

- ~~if the short message transfer would contravene the supplementary service call barring conditions, the failure is reported to the CAMEL service as specified in 3GPP TS 23.078 and the call barred error with cause barring service active is returned to MS.~~

~~If the service MAP_MO_FORWARD_SHORT_MESSAGE is started, the MSC will check whether the grouping of MAP_OPEN request and MAP_MO_FORWARD_SHORT_MESSAGE request needs segmentation. If this is the case then the MAP_OPEN request primitive shall be sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MO_FORWARD_SHORT_MESSAGE request is sent. As a response to the procedure, the servicing MSC will receive the MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the IWMSC indicating that:~~

- ~~the short message has been successfully delivered to the Service Centre. The successful submission of SM is reported to the CAMEL service as specified in 3GPP TS 23.078 and the acknowledgement is sent to the mobile station;~~

- ~~one of several error cases has occurred. The mapping between MAP error causes and RP_ERROR causes is described in 3GPP TS 23.140. The failure in the SM submission is reported to the CAMEL service as specified in 3GPP TS 23.078 and the appropriate indication is provided to the mobile station.~~

~~If the procedure failed, a provider error or an abort indication is received. The RP_ERROR cause network out of order is provided to the mobile station.~~

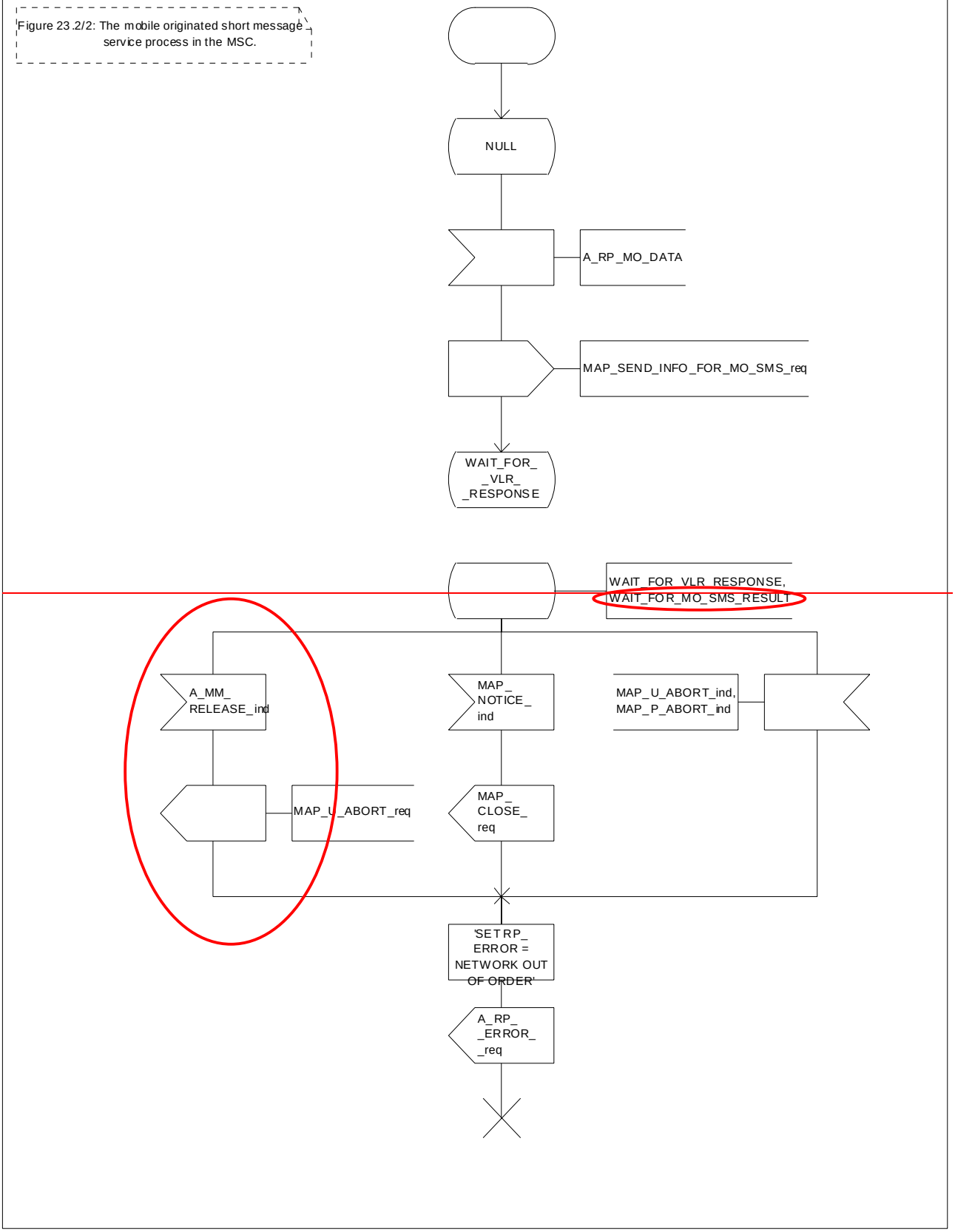
~~If the MSC itself is the interworking MSC, the short message is forwarded to the Service Centre. In that case the service MAP_MO_FORWARD_SHORT_MESSAGE is not initiated. The acknowledgement message from the Service Centre is forwarded to the mobile station (3GPP TS 23.140, 3GPP TS 24.011 [37]).~~

The mobile originated short message service proces~~sdure~~ in the MSC is shown in figure 23.2/2.

CR editor's note: the ordering of the material in the SDL diagrams has been changed to reflect better the sequence of handling. The material on the old sheet 3 and some of the material on the old sheet 1 are on the new sheet 4; the material on the old sheet 4 is on the new sheet 3.

Process MOSM_MSC 23.2_2.1(3)

Figure 23.2/2: The mobile originated short message service process in the MSC.



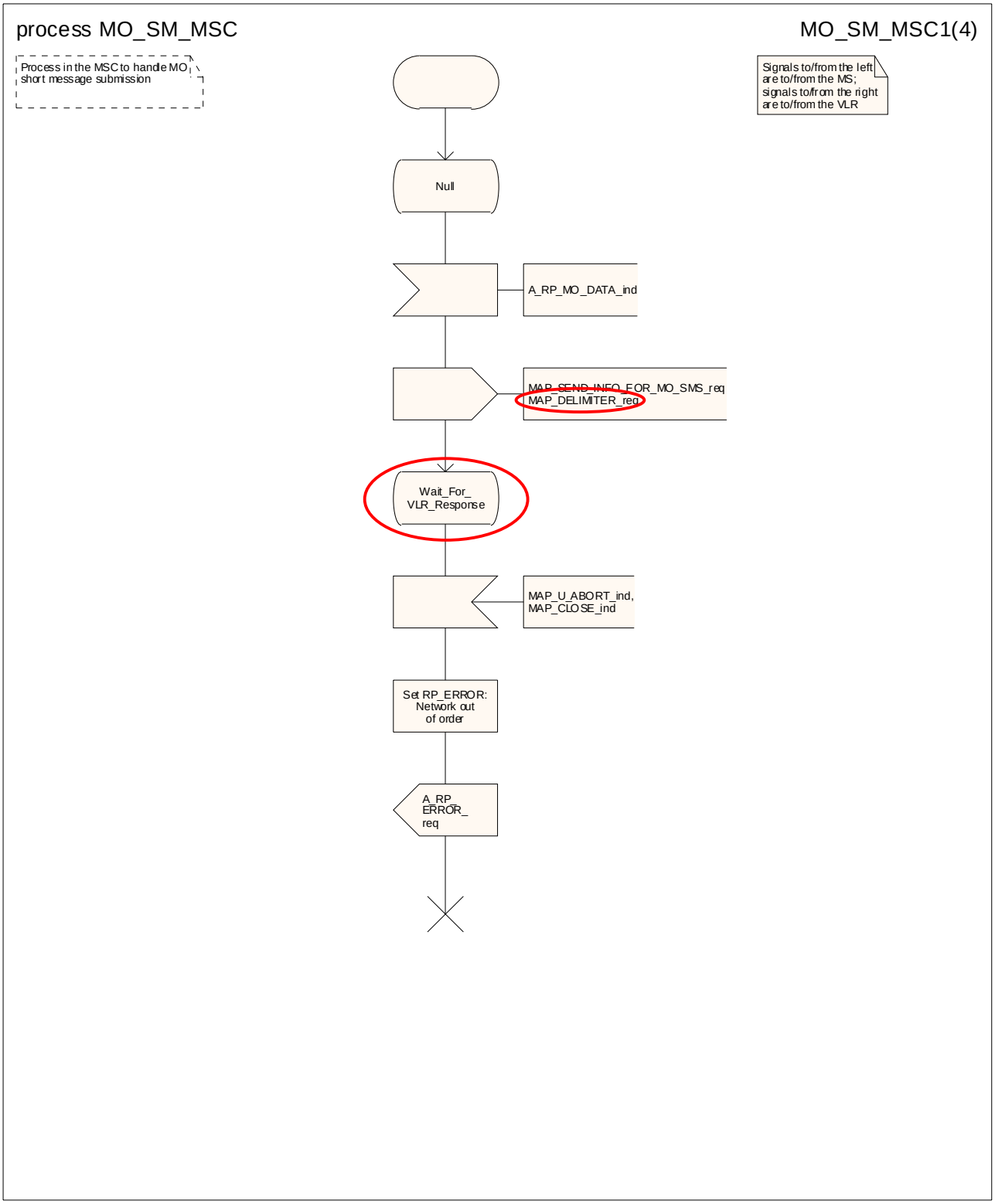
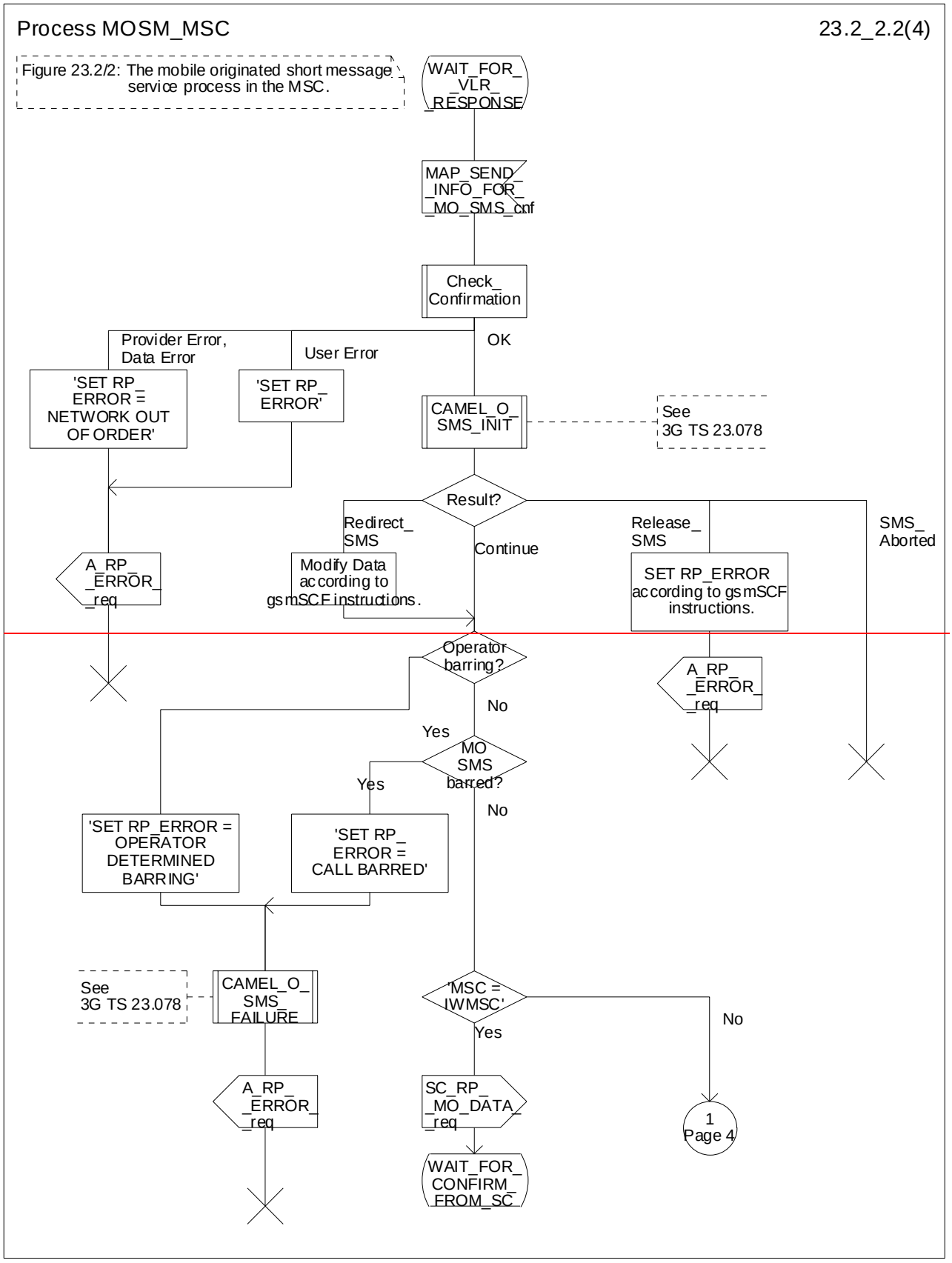


Figure 23.2/2 (sheet 1 of 4): Process MO_SM_MSC


Process MOSM_MSC
23.2_2.2(4)
Figure 23.2/2: The mobile originated short message service process in the MSC.
WAIT_FOR_VLR_RESPONSE
MAP_SEND_INFO_FOR_MO_SMS_cnf
Check_Confirmation
Provider Error, Data Error
User Error
OK
'SET RP_ERROR = NETWORK OUT OF ORDER'
'SET RP_ERROR'
CAMEL_O_SMS_INIT
See 3G TS 23.078
Result?
Redirect_SMS
Continue
Release_SMS
SMS_Aborted
A_RP_ERROR_req
Modify Data according to gsmSCF instructions.
SET RP_ERROR according to gsmSCF instructions.
Operator barring?
No
Yes
MO SMS barred?
Yes
No
'SET RP_ERROR = OPERATOR DETERMINED BARRING'
'SET RP_ERROR = CALL BARRED'
See 3G TS 23.078
CAMEL_O_SMS_FAILURE
'MSC = IWMSC'
No
Yes
A_RP_ERROR_req
SC_RP_MO_DATA_req
1 Page 4
WAIT_FOR_CONFIRM_FROM_SC

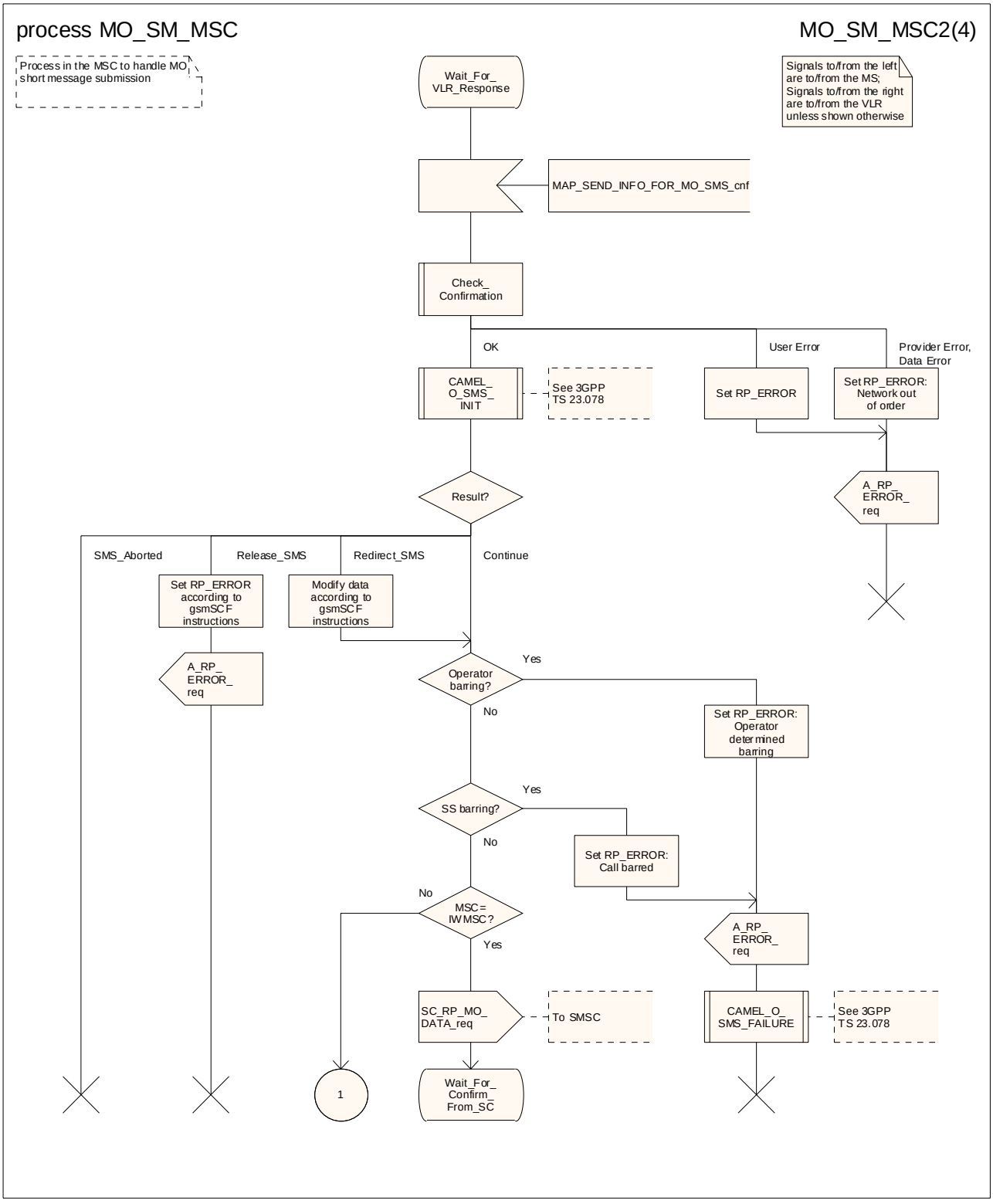
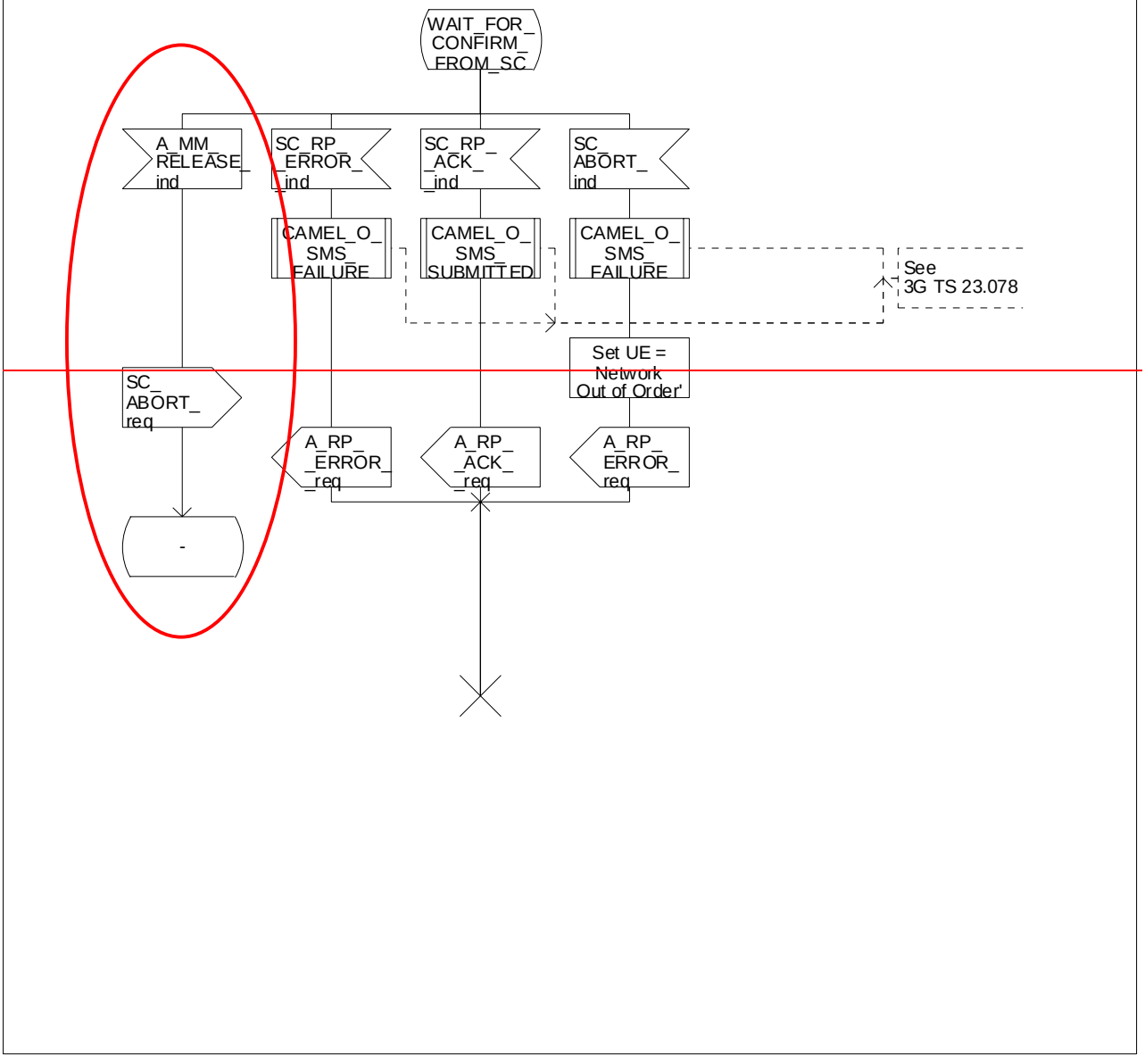


Figure 23.2/2 (sheet 2 of 4): Process MO_SM_MSC

Process MOSM_MSC 23.2_2.new3(4)

Figure 23.2/2: The mobile originated short message service process in the MSC.



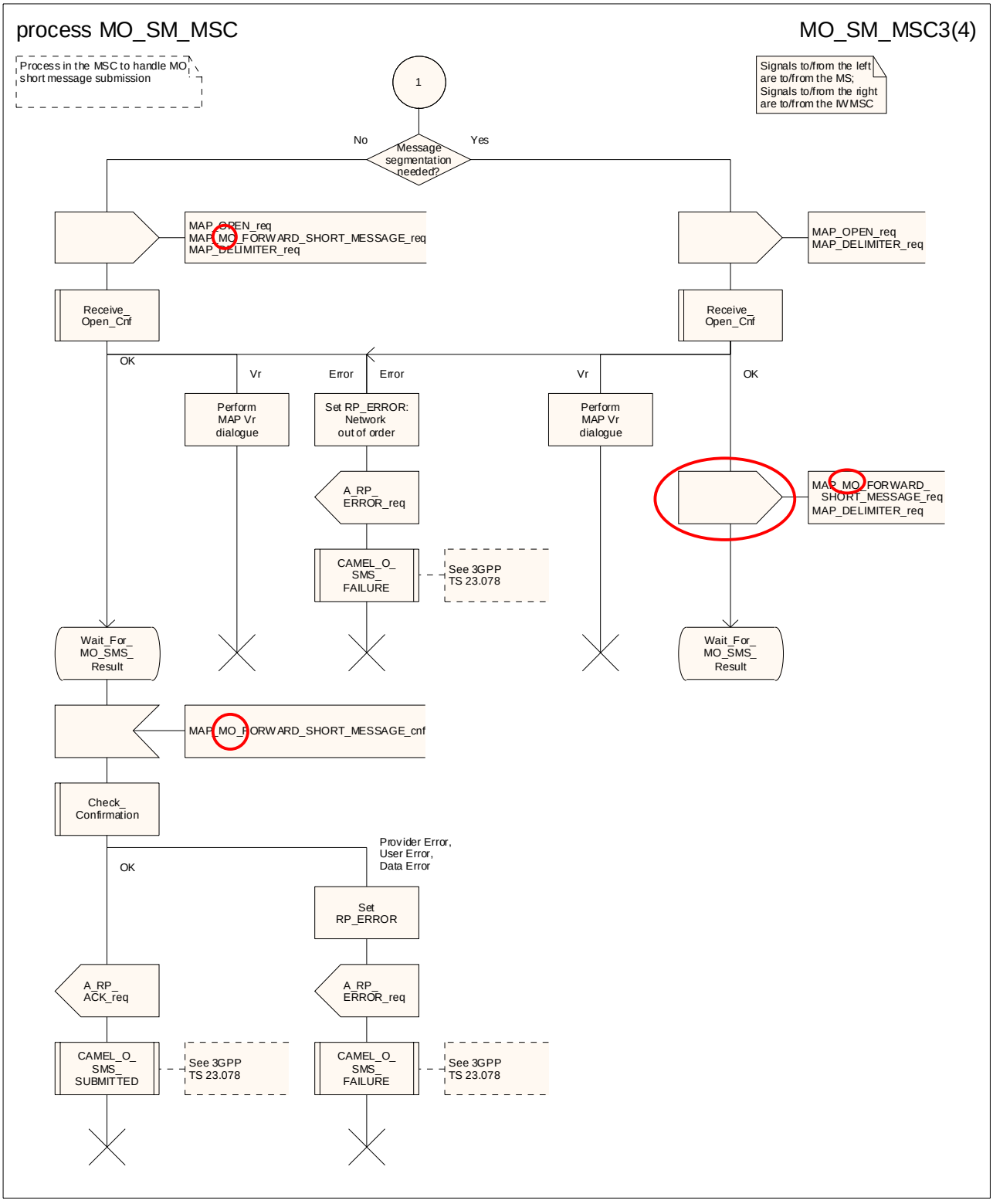
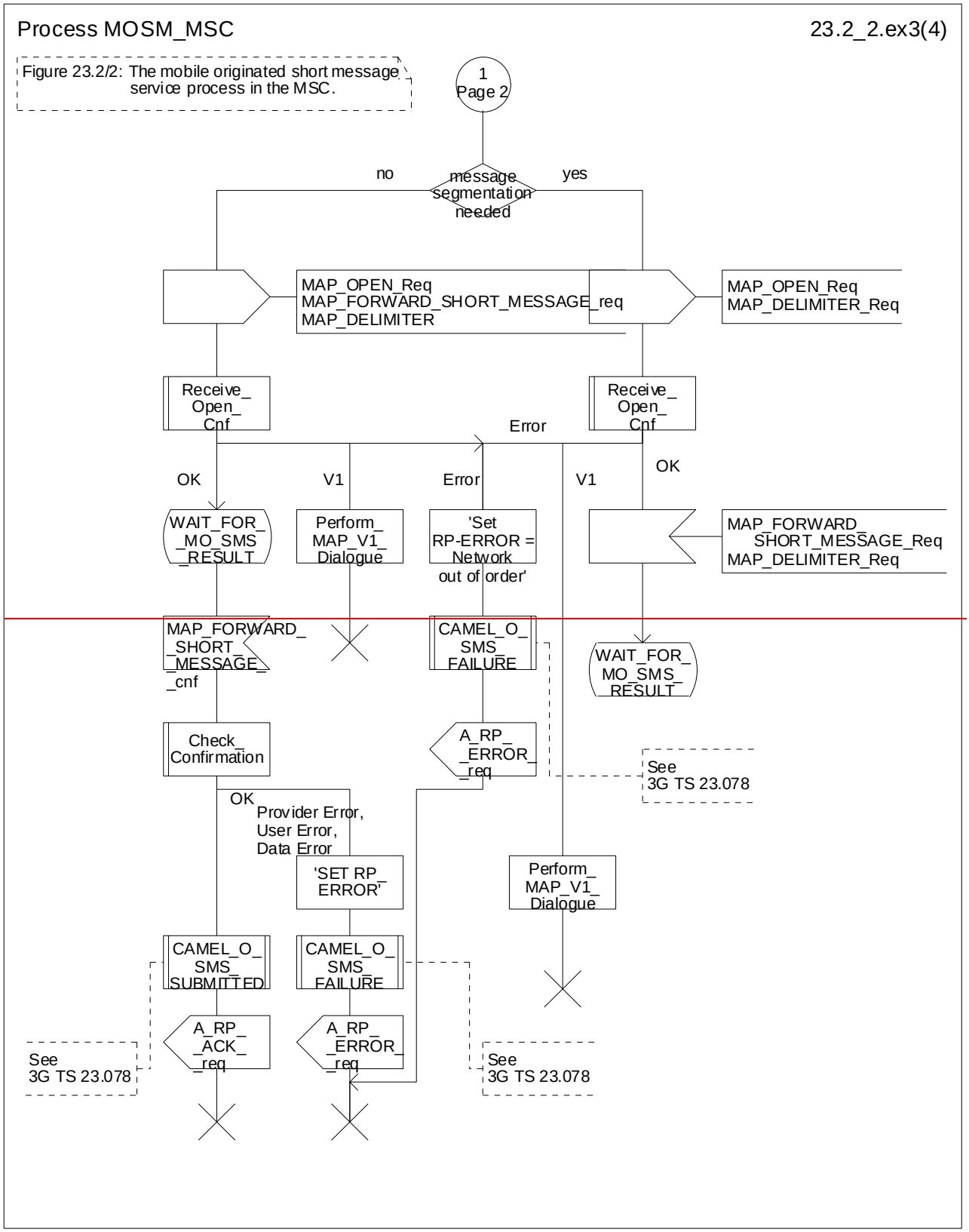


Figure 23.2/2 (sheet 3 of 4): Process MO_SM_MSC


Process MOSM_MSC
23.2_2.ex3(4)
Figure 23.2/2: The mobile originated short message service process in the MSC.
1
Page 2
no
message segmentation needed
yes
MAP_OPEN_Req
MAP_FORWARD_SHORT_MESSAGE_req
MAP_DELIMITER
MAP_OPEN_Req
MAP_DELIMITER_Req
Receive_ Open_ Cnf
Receive_ Open_ Cnf
Error
OK
V1
Error
V1
OK
WAIT_FOR_ _MO_SMS _RESULT
Perform_ MAP_V1_ Dialogue
'Set RP-ERROR = Network out of order'
MAP_FORWARD_ SHORT_MESSAGE_Req
MAP_DELIMITER_Req
MAP_FORWARD_ _SHORT_ _MESSAGE_ _cnf
CAMEL_O_ SMS_ FAILURE
WAIT_FOR_ MO_SMS_ RESULT
Check_ Confirmation
A_RP_ _ERROR_ _req
See 3G TS 23.078
OK
Provider Error, User Error, Data Error
'SET RP_ ERROR'
Perform_ MAP_V1_ Dialogue
CAMEL_O_ SMS_ SUBMITTED
CAMEL_O_ SMS_ FAILURE
A_RP_ _ACK_ _req
A_RP_ _ERROR_ _req
See 3G TS 23.078
See 3G TS 23.078

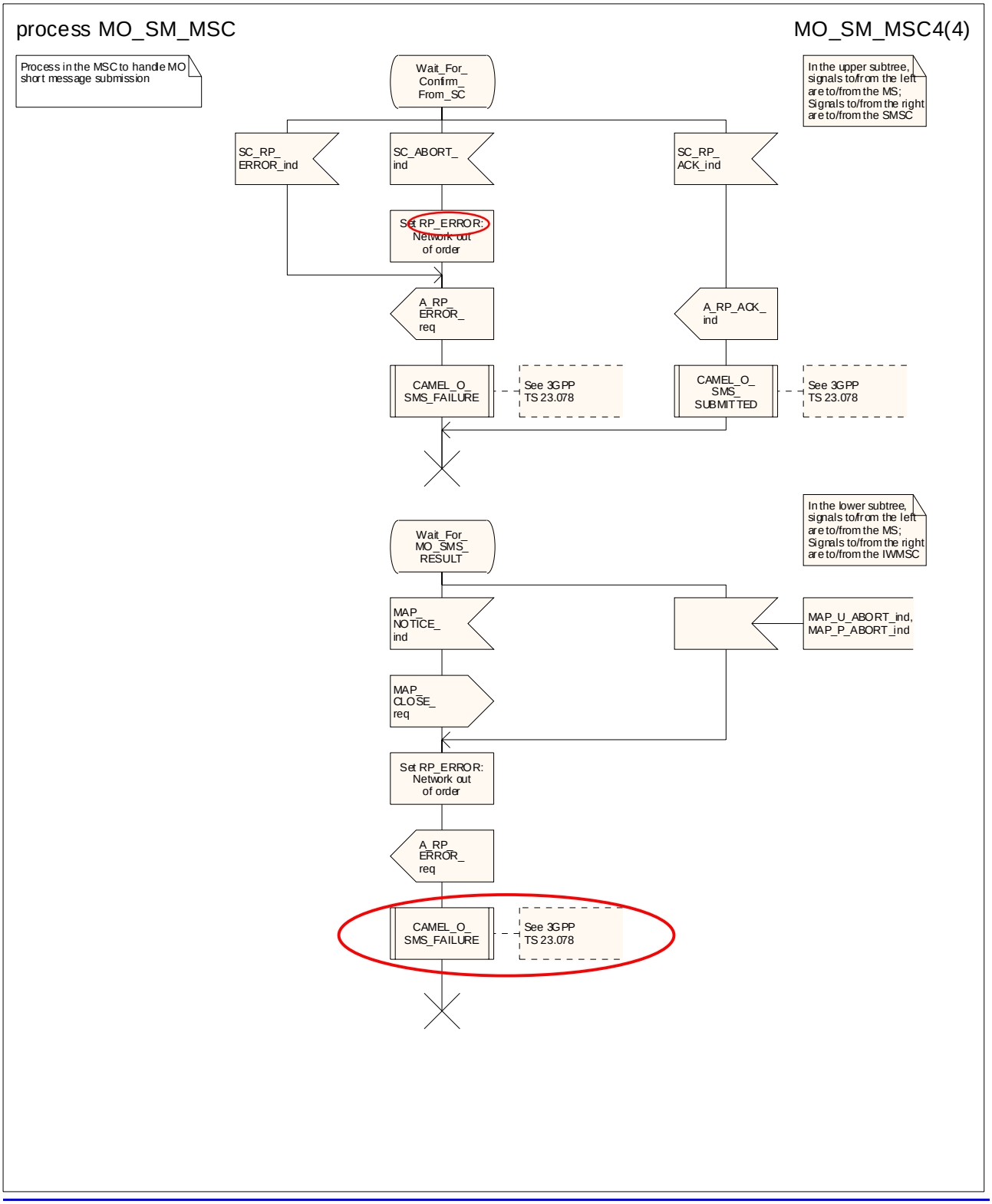


Figure 23.2/2 (sheet 4 of 4): Process MO_SM_MSC

23.2.2 Procedure in the VLR

The process is triggered by a dialogue opening request followed by a MAP_PROCESS_ACCESS_REQUEST including a CM service type Short Message Service.

If the macro Process_Access_Request_VLR takes the "OK" exit, the VLR waits for a MAP_SEND_INFO_FOR_MO_SMS indication from the MSC.

- If the MSC aborts the dialogue, the process returns to the Null state;
- if the indication is badly formed, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the appropriate user error;
- if the indication is OK, the VLR checks whether the submission of the short message is allowed
  - if MO SMS is not provisioned, VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Teleservice not provisioned";
  - if the submission of the short message is prevented by Operator Determined Barring, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Operator barring";
  - if the submission of the short message is prevented by the Barring supplementary service, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Barring service active";
  - if the submission of the short message is allowed, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the MSISDN of the requesting subscriber.~~;~~

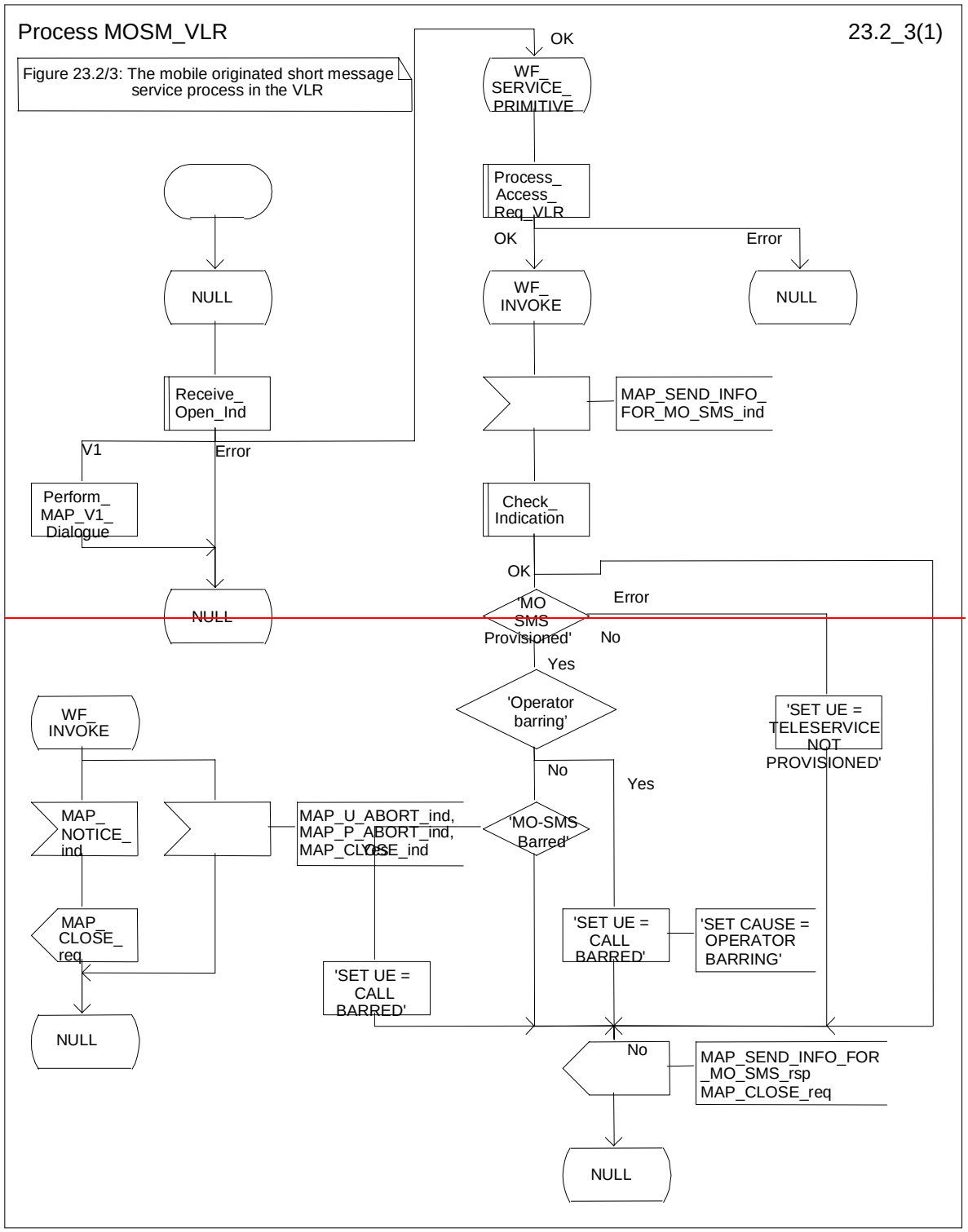
When the VLR has returned the MAP_SEND_INFO_FOR_MO_SMS response, the process returns to the Null state.

~~The MAP_PROCESS_ACCESS_REQUEST indication starts the MAP_PROCESS_ACCESS_REQUEST service in the VLR. The application context in the MAP_OPEN indication is mobile originated short message transfer.~~

~~If the service MAP_PROCESS_ACCESS_REQUEST is successful, the VLR waits for the next message from the MSC. When receiving the MAP_SEND_INFO_FOR_MO_SMS indication, the VLR acts as follows:~~

- ~~if there is incompatibility in the subscription check, the error teleservice not provisioned is returned to the MSC;~~
- ~~if the short message transfer would contravene Operator determined Barring , the call barred error with cause operator barring is returned;~~
- ~~if the short message transfer would contravene the supplementary service call barring conditions in the VLR, the call barred error with cause barring service active is returned.~~

~~When the mobile subscriber has passed all checks, the MAP_SEND_INFO_FOR_MO_SMS response is initiated and the procedure is terminated in the VLR.~~ The mobile originated short message transfer proces[s]~~dure~~ in the VLR is shown in figure 23.2/3.


Process MOSM_VLR
23.2_3(1)
Figure 23.2/3: The mobile originated short message service process in the VLR
OK
WF_ SERVICE_ PRIMITIVE
Process_ Access_ Req_VLR
OK
Error
NULL
WF_ INVOKE
NULL
Receive_ Open_Ind
MAP_SEND_INFO_ FOR_MO_SMS_ind
V1
Error
Perform_ MAP_V1_ Dialogue
Check_ Indication
OK
NULL
'MO SMS Provisioned'
Error
No
Yes
'Operator barring'
WF_ INVOKE
'SET UE = TELESERVICE NOT PROVISIONED'
No
Yes
MAP_ NOTICE_ ind
MAP_U_ABORT_ind, MAP_P_ABORT_ind, MAP_CLOSE_ind
'MO-SMS Barred'
MAP_ CLOSE_ req
'SET UE = CALL BARRED'
'SET CAUSE = OPERATOR BARRING'
'SET UE = CALL BARRED'
NULL
No
MAP_SEND_INFO_FOR _MO_SMS_rsp
MAP_CLOSE_req
NULL

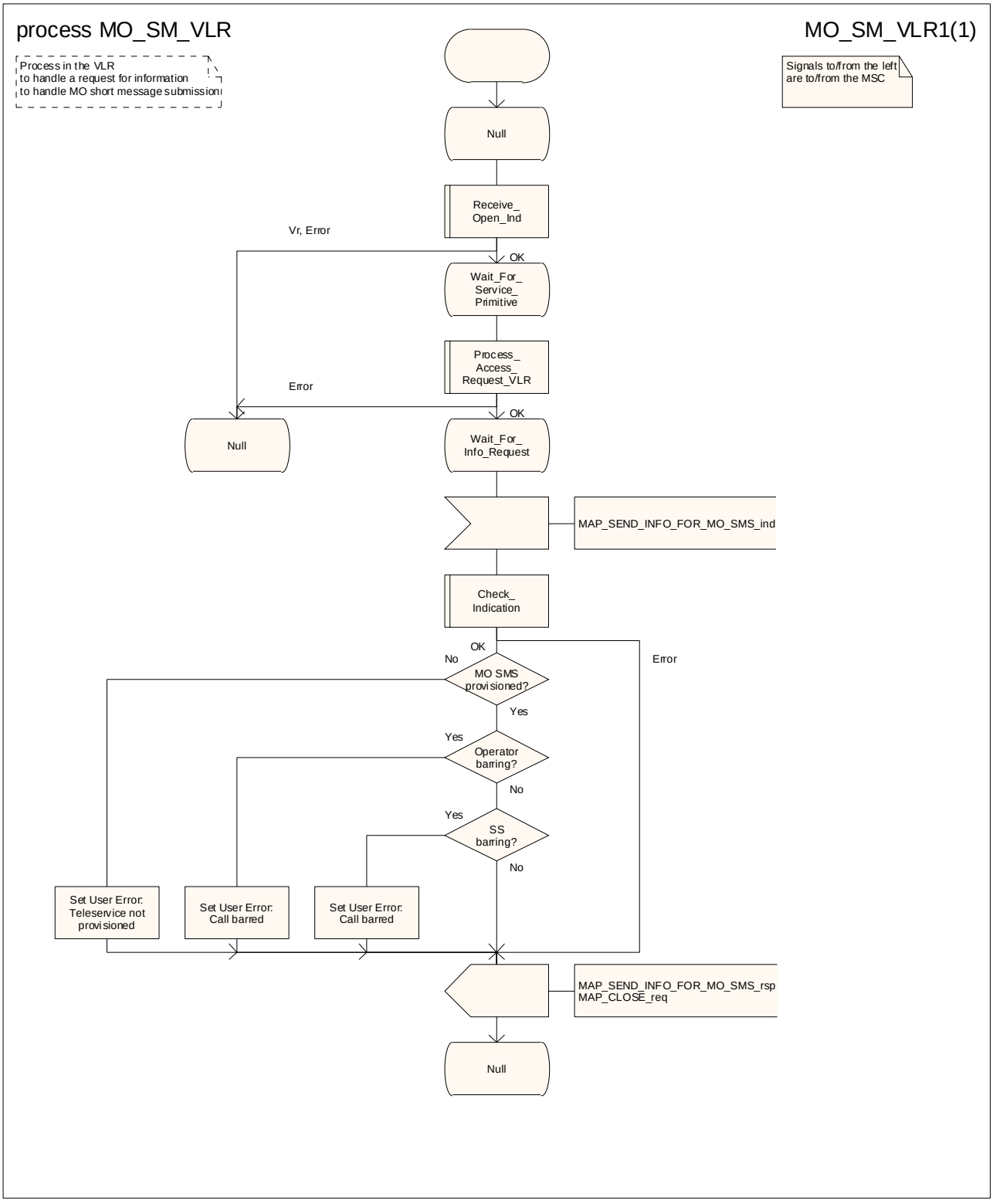


Figure 23.2/3: Process MO_SM_VLR

23.2.3 Procedure in the SMS ~~i~~Interworking MSC (SMS-IWMSC)

This procedure applies only when the SMS-IWMSC is not integrated with the serv~~ic~~ing MSC or SGSN.

The process is triggered by a dialogue opening request with the application context shortMsgMO-RelayContext.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the SMS-IWMSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the SMS-IWMSC waits for a service primitive.
  - if the dialogue with the MSC fails, the process returns to the Null state;
  - if the next primitive received is a MAP_DELIMITER indication, the SMS-IWMSC returns a MAP_DELIMITER request, and waits for a service primitive;
  - if the next primitive received is a MAP_MO_FORWARD_SHORT_MESSAGE indication, the SMS-IWMSC checks the indication.
    - if the indication is badly formed, the SMS-IWMSC returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the appropriate user error and the process returns to the Null state;
    - if the indication is OK, the SMS-IWMSC checks whether the service centre is known.
      - if the service centre is not known, the SMS-IWMSC returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the user error "SM delivery failure" with delivery failure cause "Unknown service centre" and the process returns to the Null state;
      - if the service centre is known, the SMS-IWMSC sends an SC_RP_MO_DATA request to the service centre, and waits for the response.
        - if the MAP dialogue with the serving MSC fails, the SMS-IWMSC sends an SC_A~~S~~BORT request to the service centre and the process returns to the Null state;
        - if the SMS-IWMSC receives an error response from the service centre, it returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the user error "SM delivery failure" with delivery failure cause set according to the error response received from the service centre, and the process returns to the Null state;
        - if the SMS-IWMSC receives a positive acknowledgement from the service centre, it returns a MAP_MO_FORWARD_SHORT_MESSAGE response and the process returns to the Null state.

~~When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service-user in the interworking MSC issues a MAP_DELIMITER request primitive in order to trigger the local MAP service-provider to confirm the dialogue. Then a MAP_MO_FORWARD_SHORT_MESSAGE indication shall be received.~~

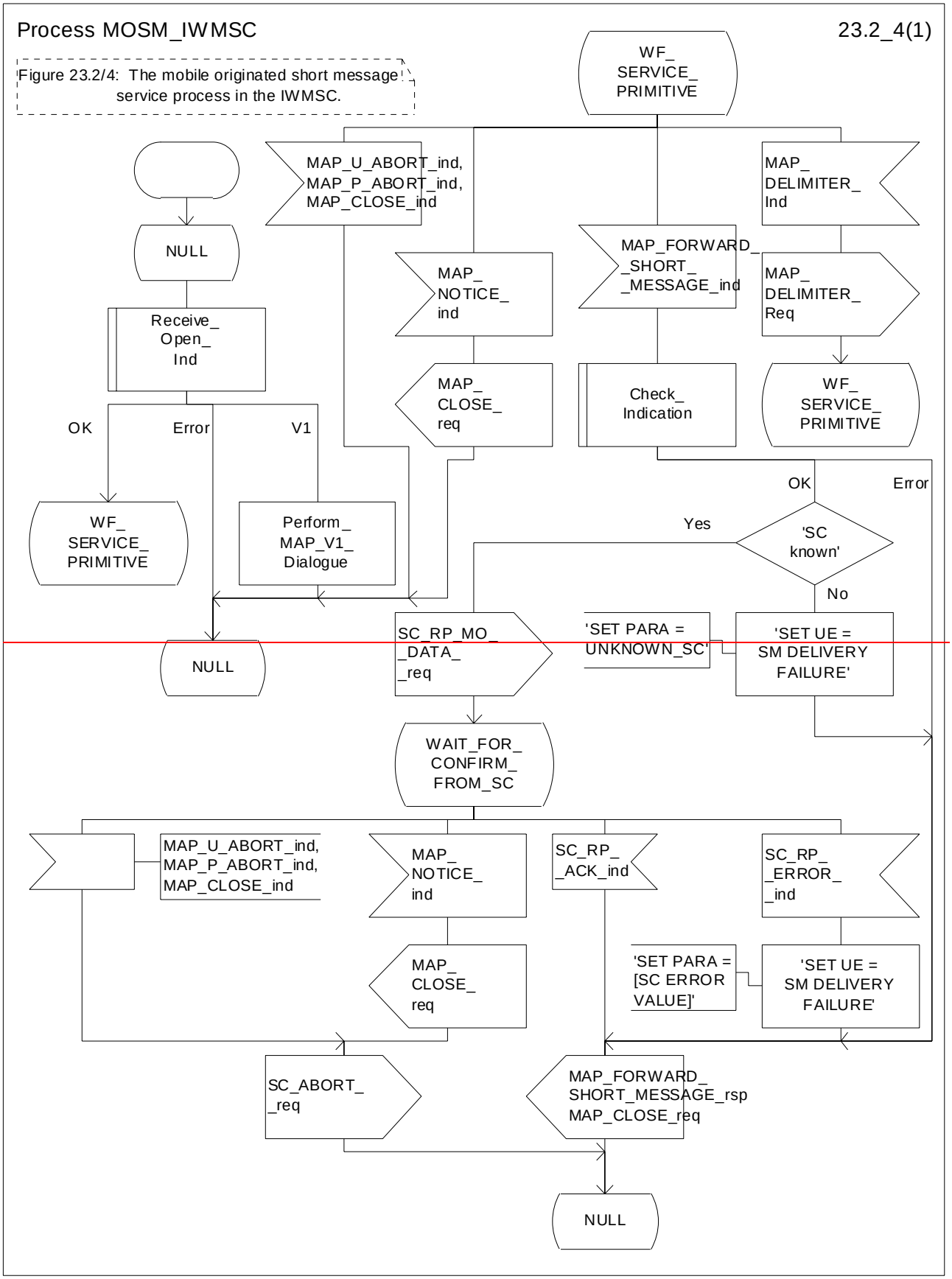
~~When a MAP_MO_FORWARD_SHORT_MESSAGE indication is correctly received, the Interworking MSC invokes forwarding of the short message to the Service Centre. If invalid data content is detected, an unexpected data value error or a data missing error is returned to the servicing MSC or SGSN.~~

~~The outcome of the procedure with the Service Centre is awaited before a MAP_MO_FORWARD_SHORT_MESSAGE response is given back to the servicing MSC or SGSN:~~

- ~~if a short message is accepted by the Service Centre, an acknowledgement is sent back to the servicing MSC or SGSN;~~
- ~~if the Service Centre is not identified, the SM Delivery Failure error is returned to the servicing MSC or SGSN;~~
- ~~if the Service Centre returns an error indication, the SM Delivery Failure error is returned to the servicing MSC with the error cause and any diagnostic information received from the Service Centre;~~

- ~~if the short message cannot be forwarded to the Service Centre or the procedure towards the Service Centre fails for some reason, a system failure error is sent to the servicing MSC or SGSN.~~

The mobile originated short message service transfer process in the SMS-IWMSC is shown in figure 23.2/4.


Process MOSM_IWMSC
23.2_4(1)
Figure 23.2/4: The mobile originated short message service process in the IWMSC.
WF_ SERVICE_ PRIMITIVE
MAP_U_ABORT_ind, MAP_P_ABORT_ind, MAP_CLOSE_ind
MAP_ DELIMITER_ Ind
NULL
MAP_ NOTICE_ ind
MAP_FORWARD_ _SHORT_ _MESSAGE_ind
MAP_ DELIMITER_ Req
Receive_ Open_ Ind
MAP_ CLOSE_ req
Check_ Indication
WF_ SERVICE_ PRIMITIVE
OK
Error
V1
OK
Error
WF_ SERVICE_ PRIMITIVE
Perform_ MAP_V1_ Dialogue
Yes
'SC known'
No
NULL
SC_RP_MO_ _DATA_ _req
'SET PARA = UNKNOWN_SC'
'SET UE = SM DELIVERY FAILURE'
WAIT_FOR_ CONFIRM_ FROM_SC
MAP_U_ABORT_ind, MAP_P_ABORT_ind, MAP_CLOSE_ind
MAP_ NOTICE_ ind
SC_RP_ _ACK_ind
SC_RP_ _ERROR_ _ind
MAP_ CLOSE_ req
'SET PARA = [SC ERROR VALUE]'
'SET UE = SM DELIVERY FAILURE'
SC_ABORT_ _req
MAP_FORWARD_ SHORT_MESSAGE_rsp MAP_CLOSE_req
NULL

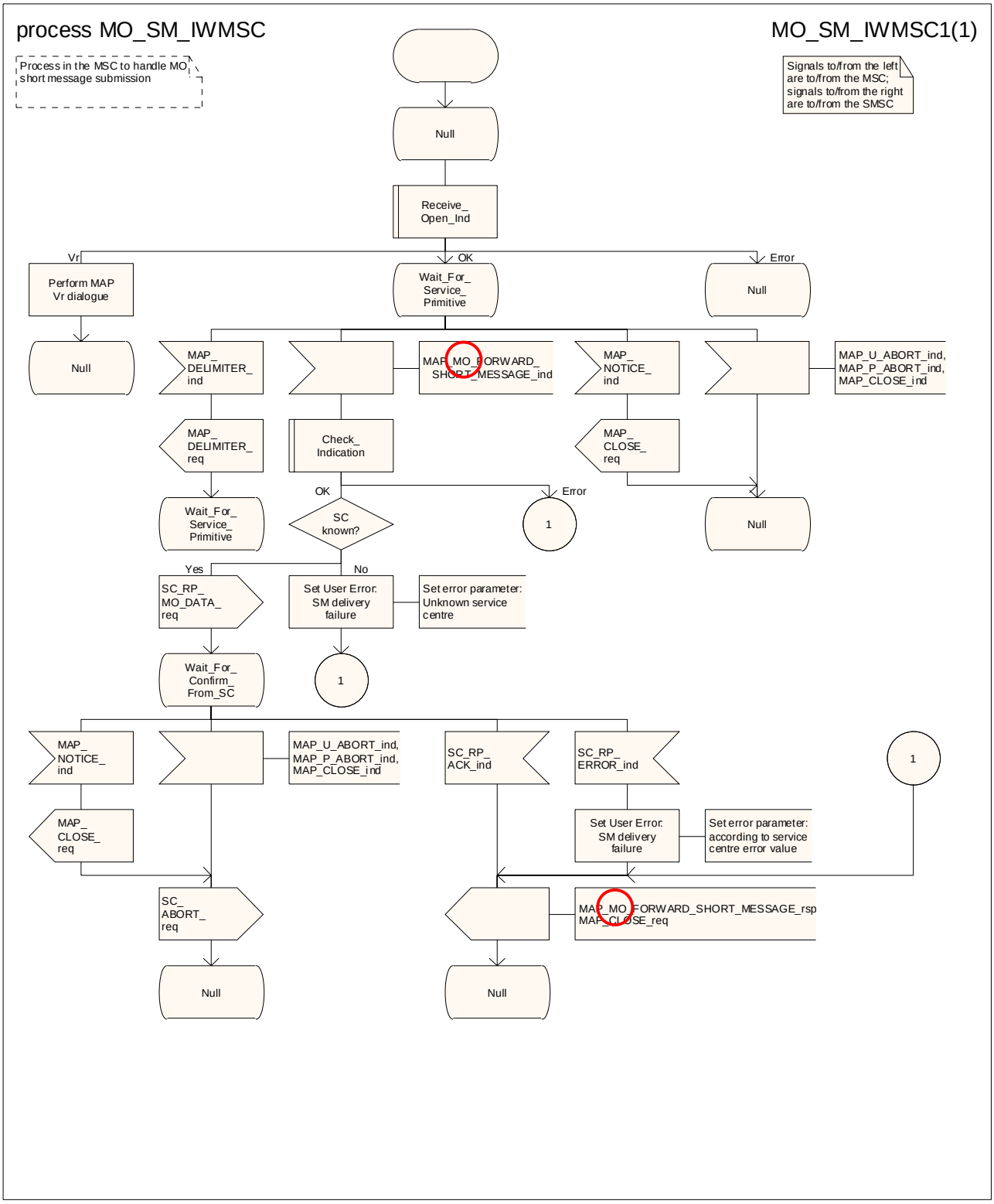


Figure 23.2/4: Process MO_SM_IWMSC

23.2.4 Procedure in the ~~servicing~~ SGSN

Any CAMEL-specific handling defined in this subclause is omitted if the SGSN does not support CAMEL control of MO SMS, or if the subscriber ~~is~~does not have a subscription for CAMEL control of MO SMS~~subscriber~~.

The process is triggered by a short message received from the MS over the Gb interface.

If the MO SMS service is not provisioned, the SGSN returns a Gb_RP_ERROR with error cause "Requested facility not subscribed", and the process returns to the Null state.

If the MO SMS service is provisioned, the SGSN calls the procedure CAMEL_O_SMS_INIT and tests the result.

- if the result was "SMS_Aborted", the process returns to the Null state;
- if the result was "Release_SMS", the SGSN returns a Gb_RP_ERROR with an error cause as instructed by the gsmSCF to the MS, and the process returns to the Null state;
- if the result was "Redirect SMS", the SGSN modifies the data for the submitted short message as instructed by the gsmSCF, and the MSC handling continues;
- if the result was "Continue", the SGSN handling continues.

The SGSN checks whether Operator Determined Barring would prevent the submission of the short message.

- if Operator Determined Barring would prevent the submission of the short message, the SGSN returns a Gb_RP_ERROR with error cause "Operator determined barring" to the MS and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null state;
- if Operator Determined Barring would not prevent the submission of the short message, the SGSN handling continues.

The SGSN checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.

- if the two requests can be grouped in a single TC message, the SGSN requests a dialogue with the SMS-IWMSC, including the MAP_MO_FORWARD_SHORT_MESSAGE request;
  - if the dialogue opening is successful, the SGSN waits for the response from the SMS-IWMSC;
  - if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
  - if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN returns a Gb_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null state.
- if the two requests cannot be grouped in a single TC message, the SGSN requests a dialogue with the SMS-IWMSC, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;
  - if the dialogue opening is successful, the SGSN sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the SMS-IWMSC, and waits for the response from the SMS-IWMSC;
  - if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
  - if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN returns a Gb_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null state.
- if the SGSN receives a MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the SMS-IWMSC, it checks the content of the confirmation;
  - if the confirmation indicates that the submission of the short message was successful, the SGSN returns a Gb_RP_ACK to the MS and reports to the gsmSCF that the short message submission was successful, and the process returns to the Null state;

- if the confirmation indicates that the submission of the short message failed, the SGSN returns a Gb_RP_ERROR with the appropriate error cause to the MS and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null stateterminates;

- ~~if the SGSN receives an LLC Release indication from the Gb interface, it aborts the dialogue with the SMS-IWMSC and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null state;~~

- if the dialogue with the SMS-IWMSC fails, the SGSN returns an A_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null state.

~~When receiving the short message from the MS, the SGSN acts as follows:~~

- ~~if there is incompatibility in the subscription check, the RP_ERROR cause requested facility not subscribed is provided to the mobile station;~~

- ~~the SGSN opens a CAMEL dialogue as specified in 3GPP TS 23.078. If the CAMEL service bars the MO SM then the failure is reported to MS;~~

- ~~if the short message transfer would contravene operator determined barring, , the failure is reported to the CAMEL service as specified in 3GPP TS 23.078 and the RP_ERROR cause operator determined barring is provided to the mobile station;~~

~~NOTE: The RP_ERROR causes are described in 3GPP TS 24.011 [37].~~

- ~~if no error is detected, the short message transmission towards the IWMSC is initiated using the MAP_MO_FORWARD_SHORT_MESSAGE request.~~

~~If the service MAP_MO_FORWARD_SHORT_MESSAGE is started, the SGSN will check whether the grouping of MAP_OPEN request and MAP_MO_FORWARD_SHORT_MESSAGE request needs segmentation.~~

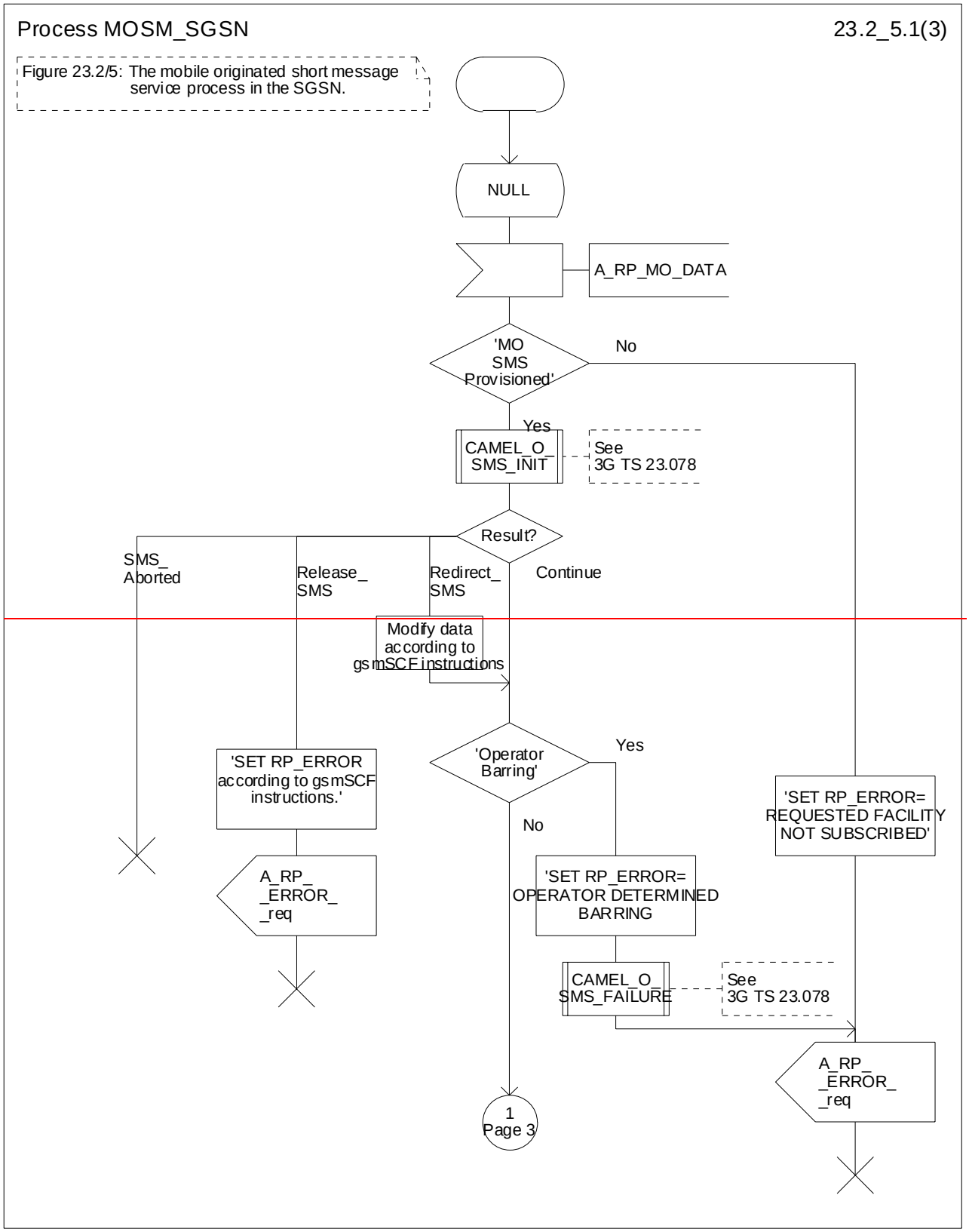
~~If this is the case then the MAP_OPEN request primitive shall be sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MO_FORWARD_SHORT_MESSAGE request is sent. As a response to the procedure, the servicing SGSN will receive the MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the IWMSC indicating that:~~

- ~~the short message has been successfully delivered to the Service Centre. The successful submission of SM is reported to the CAMEL service as specified in 3GPP TS 23.078 and the acknowledgement is sent to the mobile station;~~

- ~~one of several error cases has occurred. The mapping between MAP error causes and RP_ERROR causes is described in 3GPP TS 23.140. The failure in SM submission is reported to the CAMEL service as specified in 3GPP TS 23.078 and the appropriate indication is provided to the mobile station.~~

~~If the procedure failed, a provider error or an abort indication is received. The RP_ERROR cause network out of order is provided to the mobile station.~~

The mobile originated short message service processsdure in the SGSN is shown in figure 23.2/5.


Process MOSM_SGSN
23.2_5.1(3)
Figure 23.2/5: The mobile originated short message service process in the SGSN.
NULL
A_RP_MO_DATA
'MO SMS Provisioned'
No
Yes
CAMEL_O_ SMS_INIT
See 3G TS 23.078
Result?
SMS_ Aborted
Release_ SMS
Redirect_ SMS
Continue
Modify data according to gsmSCF instructions
'Operator Barring'
Yes
No
'SET RP_ERROR according to gsmSCF instructions.'
'SET RP_ERROR= REQUESTED FACILITY NOT SUBSCRIBED'
A_RP_ _ERROR_ _req
'SET RP_ERROR= OPERATOR DETERMINED BARRING
CAMEL_O_ SMS_FAILURE
See 3G TS 23.078
A_RP_ _ERROR_ _req
1 Page 3

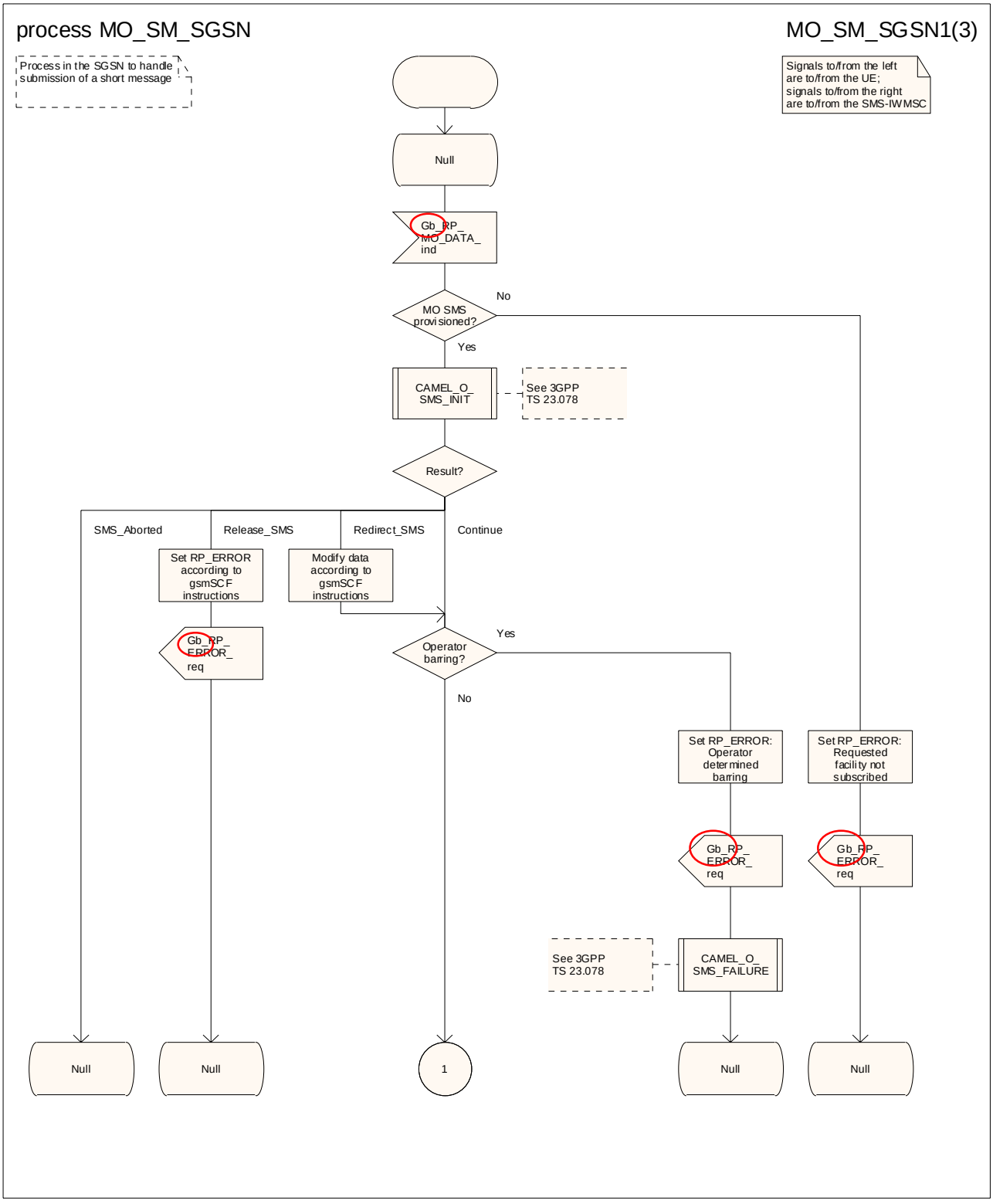
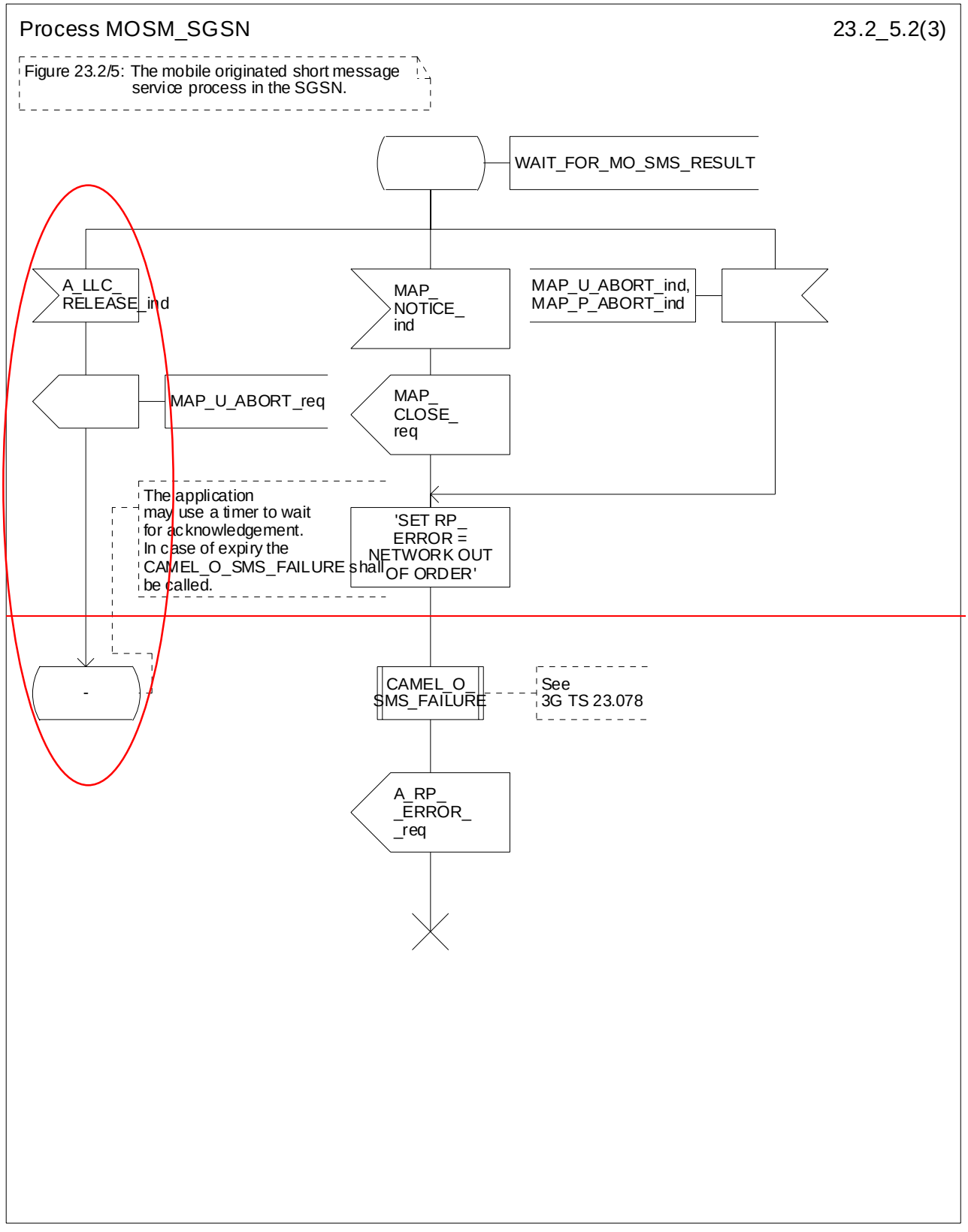


Figure 23.2/5 (sheet 1 of 3): Process MO_SM_SGSN


Process MOSM_SGSN
23.2_5.2(3)
Figure 23.2/5: The mobile originated short message service process in the SGSN.
WAIT_FOR_MO_SMS_RESULT
A_LLC_ RELEASE_ind
MAP_ NOTICE_ ind
MAP_U_ABORT_ind, MAP_P_ABORT_ind
MAP_U_ABORT_req
MAP_ CLOSE_ req
The application may use a timer to wait for acknowledgement. In case of expiry the CAMEL_O_SMS_FAILURE shall be called.
'SET RP_ ERROR = NETWORK OUT OF ORDER'
-
CAMEL_O_ SMS_FAILURE
See 3G TS 23.078
A_RP_ _ERROR_ _req

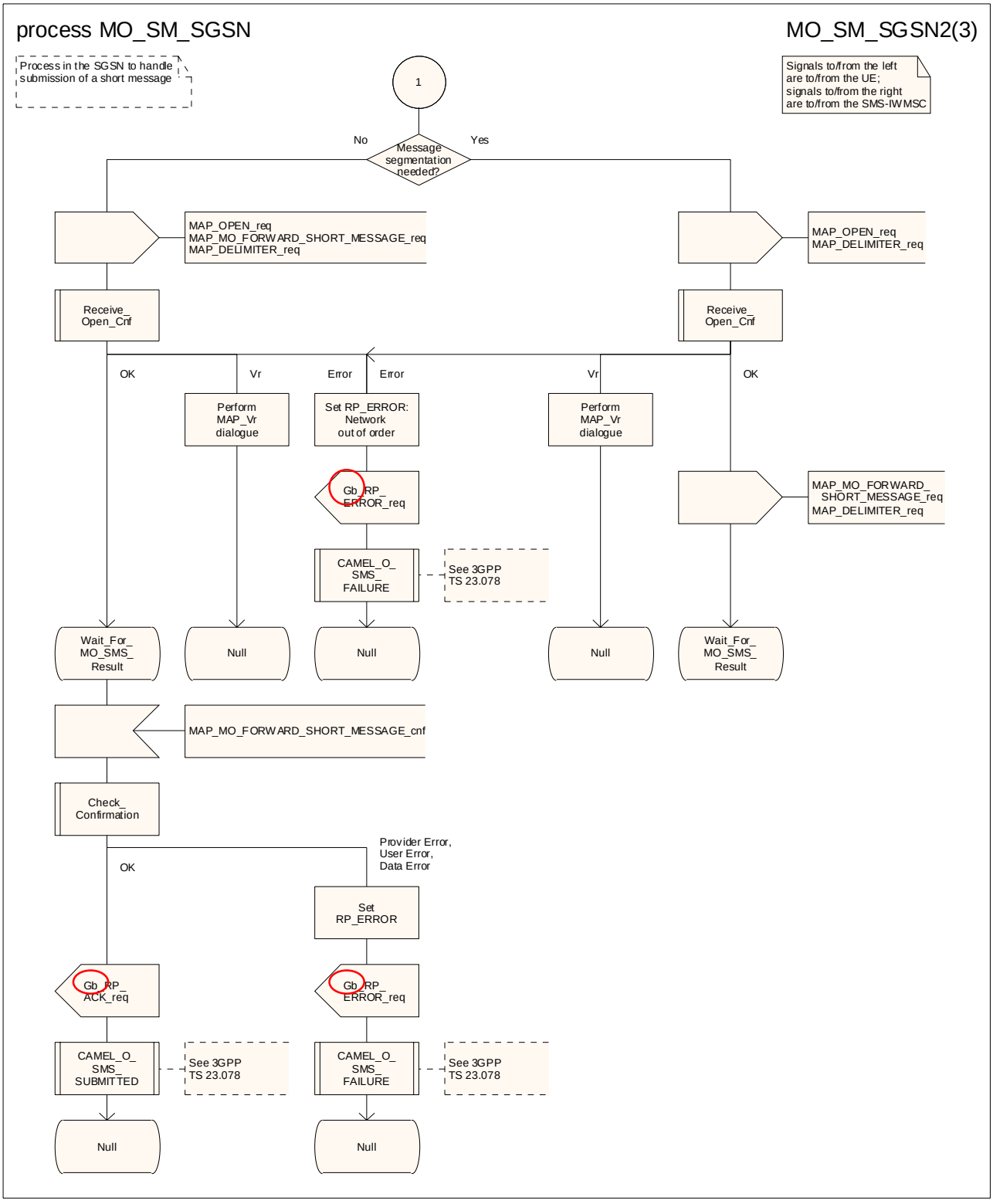
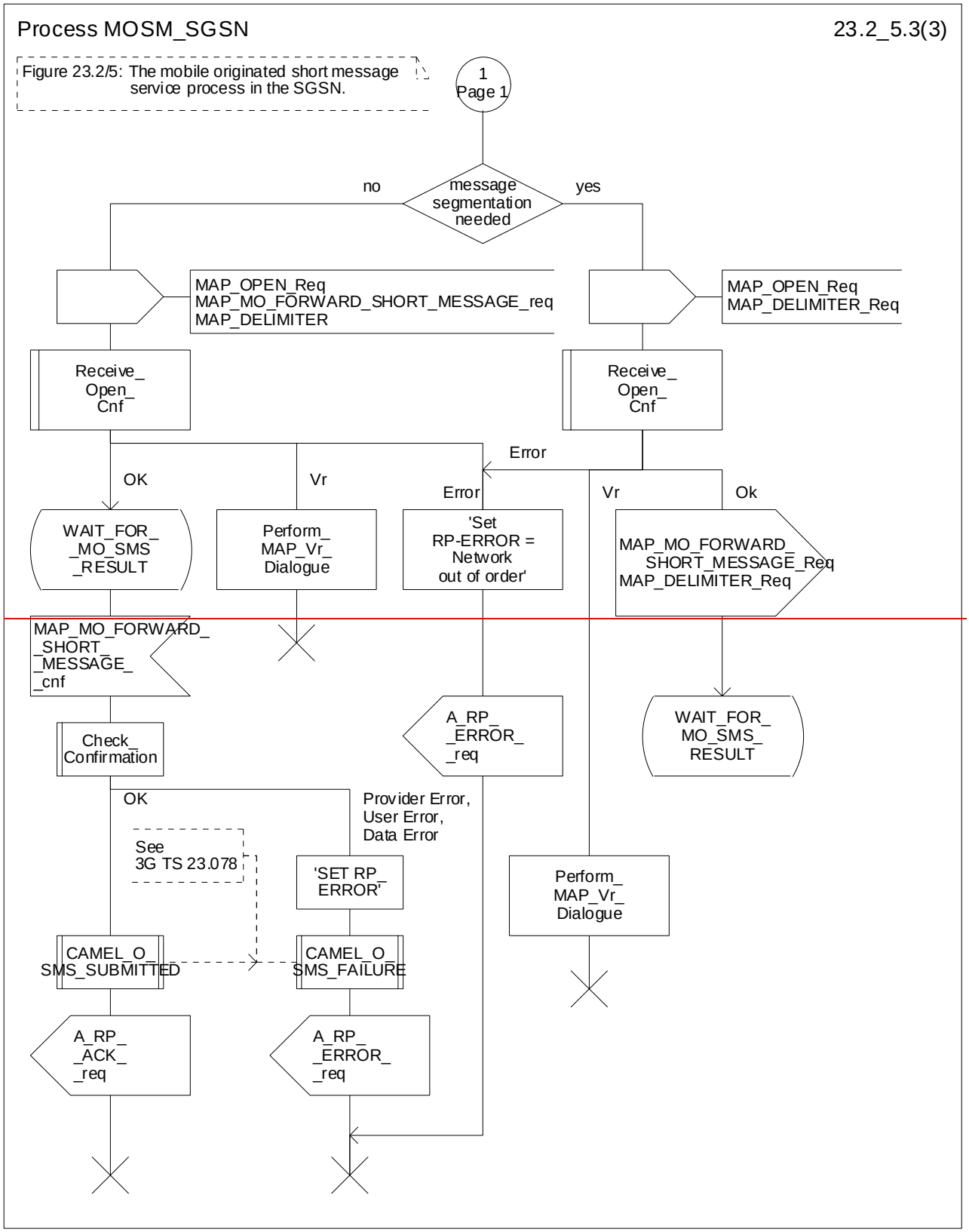


Figure 23.2/5 (sheet 2 of 3): Process MO_SM_SGSN


Process MOSM_SGSN
23.2_5.3(3)
Figure 23.2/5: The mobile originated short message service process in the SGSN.
1
Page 1
message segmentation needed
no
yes
MAP_OPEN_Req
MAP_MO_FORWARD_SHORT_MESSAGE_req
MAP_DELIMITER
MAP_OPEN_Req
MAP_DELIMITER_Req
Receive_ Open_ Cnf
Receive_ Open_ Cnf
Error
OK
Vr
Error
Vr
Ok
WAIT_FOR_ _MO_SMS _RESULT
Perform_ MAP_Vr_ Dialogue
'Set RP-ERROR = Network out of order'
MAP_MO_FORWARD_ SHORT_MESSAGE_Req
MAP_DELIMITER_Req
MAP_MO_FORWARD_ _SHORT_ _MESSAGE_ _cnf
A_RP_ _ERROR_ _req
WAIT_FOR_ MO_SMS_ RESULT
Check_ Confirmation
OK
Provider Error, User Error, Data Error
See 3G TS 23.078
'SET RP_ ERROR'
Perform_ MAP_Vr_ Dialogue
CAMEL_O_ SMS_SUBMITTED
CAMEL_O_ SMS_FAILURE
A_RP_ _ACK_ _req
A_RP_ _ERROR_ _req

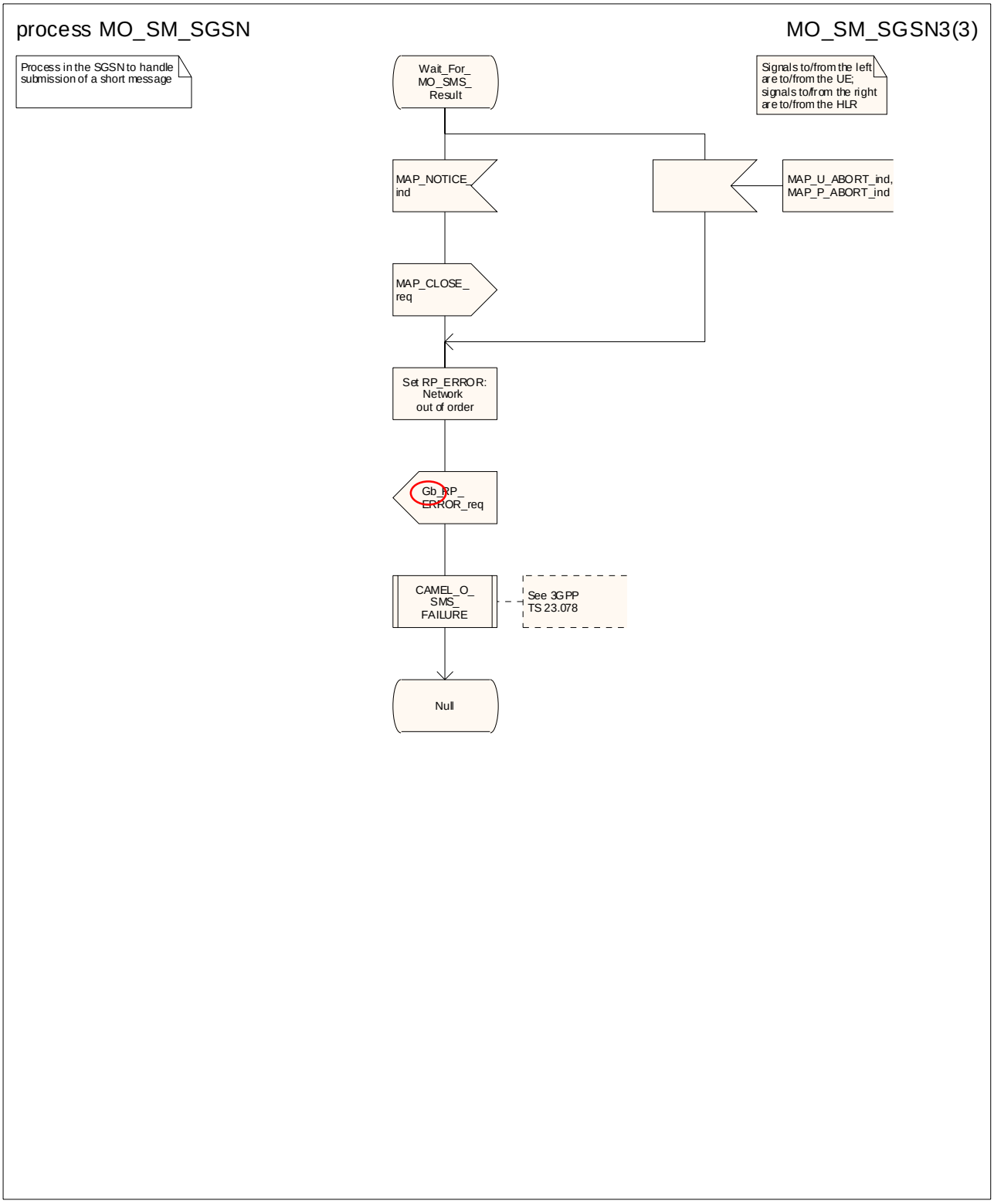


Figure 23.2/5 (sheet 3 of 3): Process MO_SM_SGSN

23.3 The mobile terminated short message transfer procedure

The mobile terminated short message transfer procedure is used for forwarding a short message or several short messages from a Service Centre to a mobile subscriber. The message flow for the mobile terminated short message procedure for a single short message transfer is shown in figure 23.3/1.

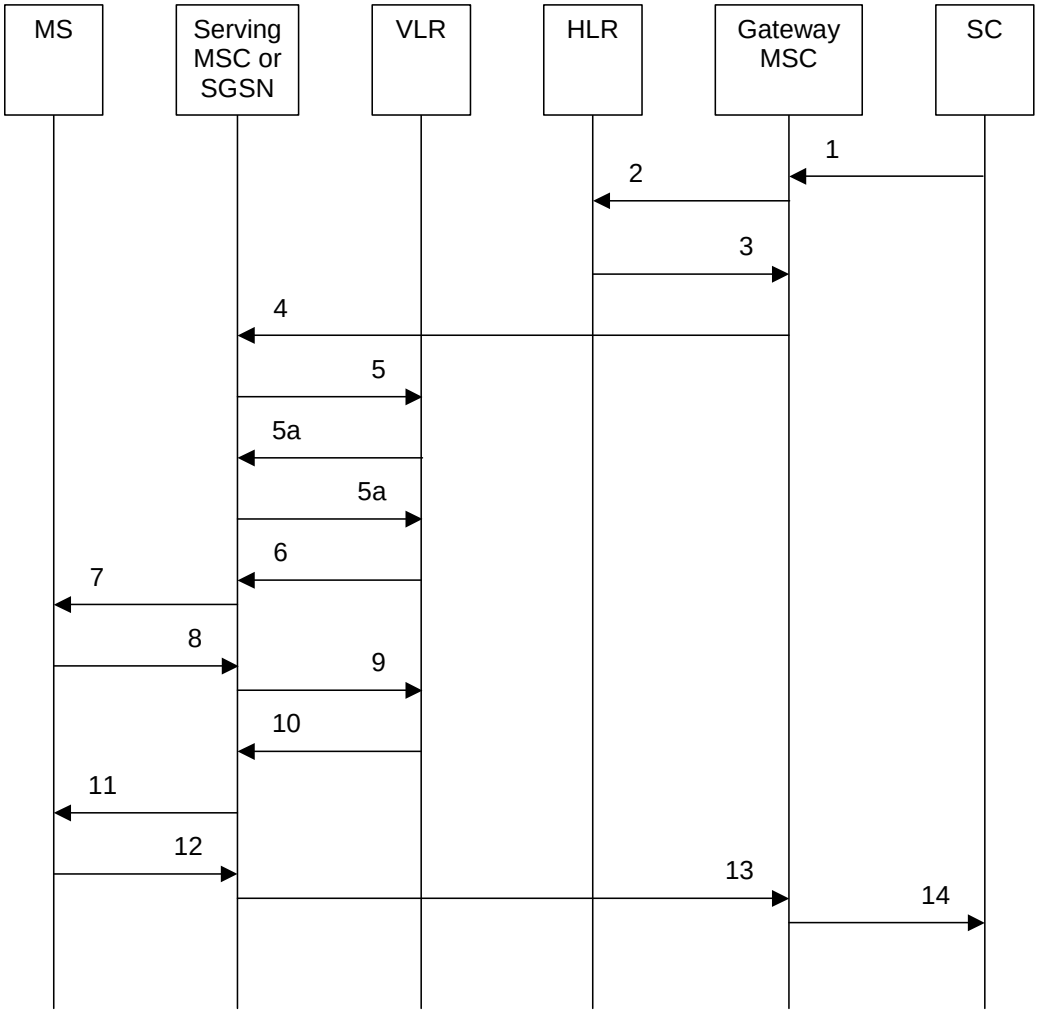


Figure 23.3/1: Mobile terminated short message service procedures

1) Short Message (3GPP TS 23.140).
2) MAP_SEND_ROUTING_INFO_FOR_SM.
3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK.
4) MAP_MT_FORWARD_SHORT_MESSAGE.
5) MAP_SEND_INFO_FOR_MT_SMS (*).
5a) MAP_CONTINUE_CAMEL_SMS_HANDLING (*)(**)
5b) MAP_SEND_INFO_FOR_MT_SMS (*)(**)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*).
7) Page (3GPP TS 24.008 [35]).
8) Page response (3GPP TS 24.008 [35]).
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*).
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*).
11) Short Message (3GPP TS 24.011 [37]).
12) Short Message Acknowledgement (3GPP TS 24.011 [37]).
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
14) Short Message Acknowledgement (3GPP TS 23.140).

(*) Messages 5), 5a), 5b), 6), 9), and 10) are not used by the SGSN.
(**) These messages are used only for a subscriber provisioned with MT-SMS-CSI in the VLR.

The message flow for the mobile terminated short message procedure for multiple short message transfer is shown in figure 23.3/2.

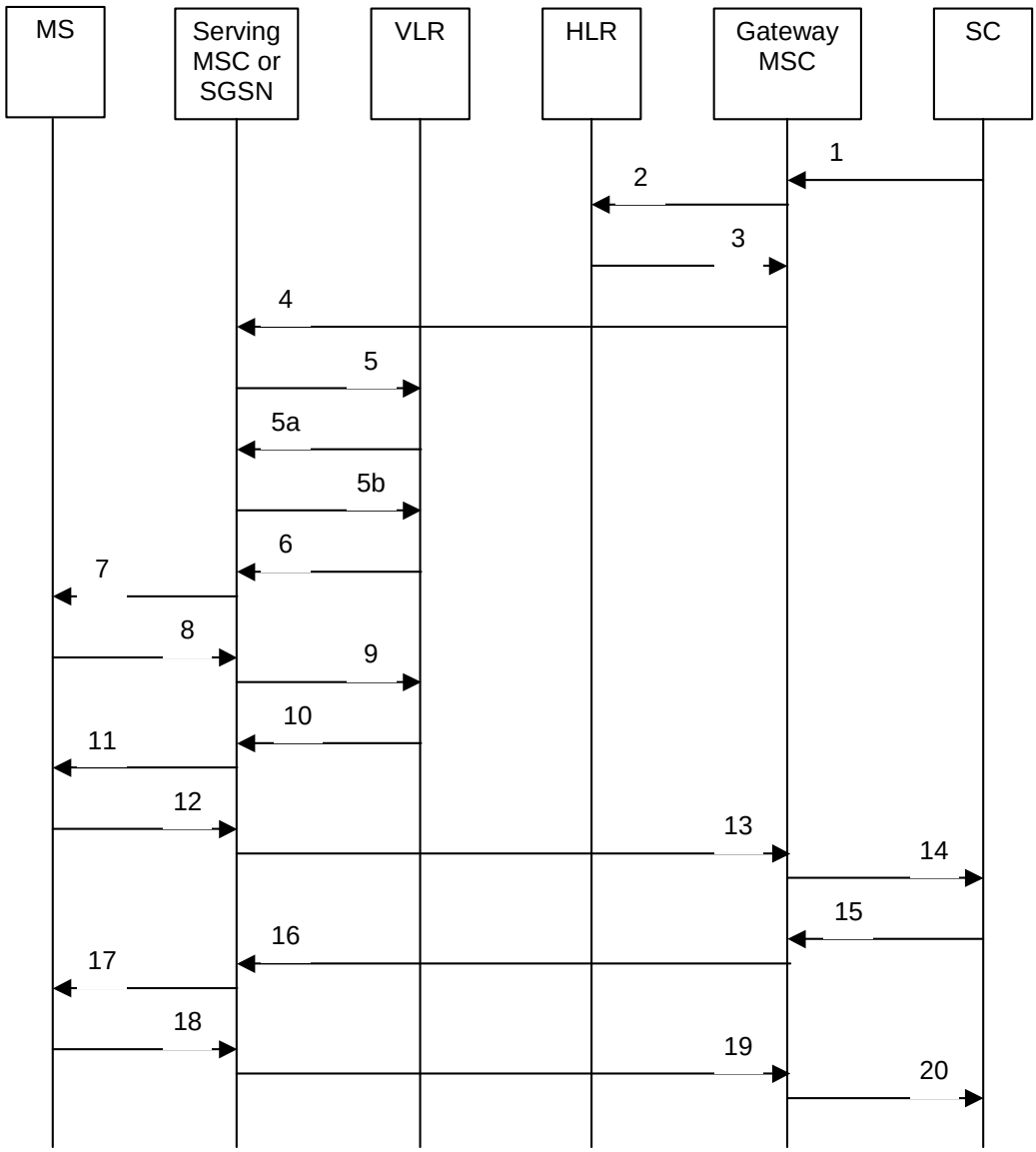


Figure 23.3/2: Mobile terminated short message procedure for multiple short message transfer

1) Short Message (3GPP TS 23.140).
2) MAP_SEND_ROUTING_INFO_FOR_SM.
3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK.
4) MAP_MT_FORWARD_SHORT_MESSAGE (note 1).
5) MAP_SEND_INFO_FOR_MT_SMS (*).
5a) MAP_CONTINUE_CAMEL_SMS_HANDLING (*)(**)
5b) MAP_SEND_INFO_FOR_MT_SMS (*)(**)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*).
7) Page (*3GPP TS 48.008 [49]*).
8) Page response (3GPP TS 24.008 [35]).
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*).
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*).
11) Short Message (3GPP TS 24.011 [37]).
12) Short Message Acknowledgement (3GPP TS 24.011 [37]).
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
14) Short Message Acknowledgement (3GPP TS 23.140).
15) Short Message (3GPP TS 23.140).
16) MAP_MT_FORWARD_SHORT_MESSAGE (note 2).
17) Short Message (3GPP TS 24.011 [37]).

18) Short Message Acknowledgement (3GPP TS 24.011 [37]).
19) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
20) Short Message Acknowledgement (3GPP TS 23.140).

(*) Messages 5), 5a), 5b) 6), 9), and 10) are not used by the SGSN.
(**) These messages are used only for a subscriber provisioned with MT-SMS-CSI in the VLR.

NOTE 1: The “More Messages To Send” flag is TRUE.
NOTE 2: The “More Messages To Send” flag is FALSE.

In the multiple short message transfer the service MAP_MT_FORWARD_SHORT_MESSAGE can be used several times. However, the short message transfer is always acknowledged to the Service Centre before the next short message is sent.

In addition the following MAP services are used:

MAP_PROCESS_ACCESS_REQUEST	(see clause 8.3); (*)
MAP_PAGE	(see clause 8.2); (*)
MAP_SEARCH_FOR_MS	(see clause 8.2); (*)
MAP_AUTHENTICATE	(see clause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see clause 8.6); (*)
MAP_CHECK_IMEI	(see clause 8.7);
MAP_FORWARD_NEW_TMSI	(see clause 8.9); (*)
MAP_REPORT_SM_DELIVERY_STATUS	(see clause 12.3);
MAP_INFORM_SERVICE_CENTRE	(see clause 12.6);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see clause 9.1); (*)
MAP_READY_FOR_SM	(see clause 12.4).

(*) Those messages are not used by SGSN.

23.3.14 Procedures in the SMS-GMSC

Any CAMEL-specific handling described in this subclause is omitted if the SMS-GMSC does not support CAMEL. CAMEL-specific handling is invoked only if the SMS-GMSC is integrated with the VMSC.

The short message handling function of the GMSCSMS-GMSC requests routing information when it receives an SC_RP_MT_DATA indication mobile terminated short message is received from a Service Centre.

The GMSCSMS-GMSC requests a MAP dialogue and sends the a MAP_SEND_ROUTING_INFO_FOR_SM request, with an indication of whether the SMS-GMSC supports the delivery of short messages via an SGSN, to the HLR containing the subscriber data of the mobile subscriber.

- if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure" and the process returns to the Null state;

- if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol, and the handling continues as follows:

  - if the HLR did not supply routeing information, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error, and the process returns to the Null state;

NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].

  - if the HLR supplied routeing information, the handling continues as described below under the heading "Short message delivery attempts".

- if the macro Receive_Open_Cnf takes the "OK" exit, the SMS-GMSC waits for routeing information from the HLR.

While the SMS-GMSC is waiting for routeing information from the HLR:

- if the service centre aborts the dialogue with the SMS-GMSC, the SMS-GMSC aborts the dialogue with the HLR and the process returns to the Null state;

- If the dialogue with the HLR fails, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure" and the process returns to the Null state;

- if the SMS-GMSC receives a MAP_SEND_ROUTING_INFO_FOR_SM confirmation, it checks the confirmation.

  - if the confirmation contained a provider error or a data error, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure", and the process returns to the Null state;

  - if the confirmation contained a user error, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error and waits for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR;

NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].

  - if the confirmation contained routeing information, the SMS-GMSC checks whether the routeing information included an LMSI;

    - if the routeing information included an LMSI, the SMS-GMSC sets the destination reference to the IMSI of the destination subscriber, and the destination address in the short message relay protocol to the LMSI;

    - if the routeing information did not include an LMSI, the SMS-GMSC marks the destination reference as not included, and sets the destination address in the short message relay protocol to the IMSI of the destination subscriber.

  - in both cases, the SMS-GMSC then waits for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR;

While the SMS-GMSC is waiting for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR:

- if the service centre aborts the dialogue with the SMS-GMSC, the SMS-GMSC aborts the dialogue with the HLR and the process returns to the Null state;

- if the dialogue with the HLR fails, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

- if the HLR closes the dialogue without sending a MAP_INFORM_SERVICE_CENTRE, the SMS-GMSC checks whether routeing information was received from the HLR.

  - if the HLR did not supply routeing information, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error, and the process returns to the Null state;

NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].

  - if the HLR supplied routeing information, the handling continues as described below under the heading "Short message delivery attempts".

- if the SMS-GMSC receives a MAP_INFORM_SERVICE_CENTRE indication, it checks the indication.

  - if the indication is badly formed, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

  - if the indication is OK, the SMS-GMSC checks whether the MAP_SEND_ROUTING_INFO_FOR_SM confirmation contained an error.

- if the MAP_SEND_ROUTING_INFO_FOR_SM confirmation contained an error, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

- if the MAP_SEND_ROUTING_INFO_FOR_SM confirmation did not contain an error, which implies that it contained routeing information, the handling continues as described below under the heading "Short message delivery attempts".

~~As an outcome of the procedure the SMS-GMSC receives a MAP_SEND_ROUTING_INFO_FOR_SM indicating:~~

~~- an unsuccessful event indication containing an error;~~

~~The mapping between the MAP error causes and the RP_ERROR causes is explained in 3GPP TS 23.140.~~

~~- a successful event indication containing the following parameters:~~

~~- an IMSI optionally accompanied by an LMSI; and~~

~~- one or two routing addresses (servicing MSC, SGSN or both numbers).~~

~~The LMSI shall not be used if the short message is routed towards the SGSN.~~

~~The GMSC may also receive a MAP_INFORM_SERVICE_CENTRE indication after the MAP_SEND_ROUTING_INFO_FOR_SM confirmation. The parameter MW Status in the message indicates whether or not the Service Centre address is stored in the Message Waiting Data. It also indicates the status of the MCEF, MNRF and MNRG flags in the HLR. The message also indicates the value of the MNRR if this is stored in the HLR and one or both of the MNRF and MNRG flags is set in the HLR.~~

~~If the MSISDN-Alert stored in the MWD data is not the same as the MSISDN sent to the HLR, the MSISDN-Alert is included in the MAP_INFORM_SERVICE_CENTRE indication. This MSISDN-Alert shall be transferred in a delivery failure report to the SC.~~

~~In the abnormal end or in the provider error case the SMS-GMSC reports a system failure error to the SC.~~

Short message delivery attempts

When the ~~GMSC~~SMS-GMSC has obtained the routing information needed to forward a mobile terminated short message to the serving node (MSC or SGSN) it calls the procedure MT_SM_Delivery_Attempt_GMSC.

If the SMS-GMSC receives both MSC and SGSN numbers ~~are received~~ from the HLR as routeing information, ~~the~~ it ~~SMS-GMSC~~ may choose which serving node ~~(SGSN or MSC)~~to use for the first delivery attempt.

If the first delivery attempt succeeds, or the delivery is aborted, the process returns to the Null state. If the first delivery attempt fails and the HLR provided a second routeing address, the SMS-GMSC attempts to deliver the short message through the second choice serving node. The process then returns to the Null state.

For each delivery attempt, the SMS-GMSC checks whether the serving node for the delivery attempt is the SMS-GMSC. If the serving node for the delivery attempt is the SMS-GMSC, ~~then~~ the handling continues as described under the heading "Serving node is SMS-GMSC"; if the serving node for the delivery attempt is not the SMS-GMSC, the handling continues as described under the heading "Serving node is separate from SMS-GMSC".

Serving node is SMS-GMSC

The SMS-GMSC invokes the macro MT_SM_Transfer_MSC. This macro is described in subclause 23.3.3~~1~~ and in figure ~~23.3/4~~23.3/8.

If the macro takes the Abort exit, the ~~GMSC~~SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98] and the procedure returns a Fail result.

If the macro takes the Error ~~or Release SMS~~ exit, the ~~GMSC~~SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98]. If required, the ~~GMSC~~SMS-GMSC reports the outcome of the delivery attempt to the HLR. The ~~GMSC~~SMS-GMSC sends an error report to the service centre and the procedure returns a Fail result.

NOTE: if the macro takes the Error exit, the SMS-GMSC maps the MAP User Error to the corresponding SC_RP error, as defined in 3GPP TS 23.040 [26].

If the macro takes the Release SMS exit, the SMS-GMSC sends an error report to the service centre and the procedure returns a Fail result.

If the macro takes the OK exit, the ~~GMSC~~SMS-GMSC reports the successful delivery to the gsmSCF as described in 3GPP TS 23.078 [98] and checks whether the "More messages to send" indication was set in the request from the service centre.

- If the "~~-~~More messages to send" indication was not set, the ~~GMSC~~SMS-GMSC reports the successful delivery to the HLR, if necessary, and reports the successful delivery to the service centre. The procedure returns a Pass result.

- If the " More messages to send" indication was set, the ~~GMSC~~SMS-GMSC reports the successful delivery to the service centre and waits for another message delivery request from the service centre. When the request is received, the ~~GMSC~~SMS-GMSC opens a dialogue with the gsmSCF as described in 3GPP TS 23.078 [98].

  - If the gsmSCF bars the delivery of the short message (Release_SMS result) the ~~GMSC~~SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.

  - If the gsmSCF instructs the ~~GMSC~~SMS-GMSC to continue with the delivery, the ~~GMSC~~SMS-GMSC sends the message over the access interface to the destination MS and waits for a response.

    - If the delivery was successful, the ~~GMSC~~SMS-GMSC reports the successful delivery to the gsmSCF as described in 3GPP TS 23.078 [98] and checks whether the "More messages to send" indication was set in the request from the service centre, as above.

    - If the delivery was unsuccessful, the ~~GMSC~~SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98]. If required, the ~~GMSC~~SMS-GMSC reports the outcome of the delivery attempt to the HLR. The ~~GMSC~~SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.

Serving node is separate from SMS-GMSC

~~If the serving node for the delivery attempt is not the GMSC, t~~The ~~GMSC~~SMS-GMSC checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.

- if the two requests can be grouped in a single TC message, the SMS-GMSC requests a dialogue with the serving node, including the MAP_MT_FORWARD_SHORT_MESSAGE request;

  - if the dialogue opening is successful, the SMS-GMSC waits for the response from the serving node;

  - if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol.

    - if delivery was successful, the procedure returns a "Pass" result;

    - if delivery failed, the procedure returns a "Fail" result.

  - if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with cause "System Failure" to the SC and the procedure returns a "Fail" result.

- if the two requests can be grouped in a single TC message, the SMS-GMSC requests a dialogue with the serving node, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;

  - if the dialogue opening is successful, the SMS-GMSC sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the serving node, and waits for the response from the serving node;

  - if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol.

    - if delivery was successful, the procedure returns a "Pass" result;

    - if delivery failed, the procedure returns a "Fail" result.

  - if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with cause "System Failure" to the SC and the procedure returns a "Fail" result.

~~If the grouping of MAP_OPEN request and MAP_MT_FORWARD_SHORT_MESSAGE request together would need segmenting, these primitives must not be grouped together. The MAP_OPEN request primitive is sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MT_FORWARD_SHORT_MESSAGE request is sent.~~

If ~~an LMSI has been provided in~~ the MAP_SEND_ROUTING_INFO_FOR_SM confirmation included an LMSI, it can be included in the sm-RP-DA information field of the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC. In this case, the IMSI ~~must~~ shall be included in the Destination Reference of the MAP_OPEN request. The SMS-GMSC shall not send an LMSI to an SGSN. If ~~the LMSI is not sent by~~ the SMS-GMSC does not send an LMSI to the serving node, the sm-RP-DA information field in the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC or SGSN shall contain the IMSI, and the Destination Reference in the MAP_OPEN request shall not be present. The ~~Service Centre address is sent in the~~ parameter SM_RP_OA shall contain the Service Centre address. The More Messages To Send flag is set to TRUE or FALSE ~~depending on~~according to the information received from the Service Centre.

When the ~~GMSC~~SMS-GMSC receives the response from the serving node, it checks the content of the response.

If the response indicates successful delivery, the ~~GMSC~~SMS-GMSC checks whether the "More messages to send" indication was set in the request from the service centre.

- If the " More messages to send" indication was not set, the ~~GMSC~~SMS-GMSC reports the successful delivery to the HLR, if necessary, and reports the successful delivery to the service centre. The procedure returns a Pass result.

- If the " More messages to send" indication was set, the ~~GMSC~~SMS-GMSC reports the successful delivery to the service centre and waits for another message delivery request from the service centre. When the request is received, the ~~GMSC~~SMS-GMSC sends a MAP_MT_FORWARD_SHORT_MESSAGE request to the serving node and waits for a response.

  - If the delivery was successful, the ~~GMSC~~SMS-GMSC checks whether the "More messages to send" indication was set in the request from the service centre, as above.

  - If the delivery was unsuccessful, the ~~GMSC~~SMS-GMSC reports the outcome of the delivery attempt to the HLR, if required. The ~~GMSC~~SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.

The ~~GMSC~~SMS-GMSC invokes the procedure MAP_REPORT_SM_DELIVERY_STATUS, if:

- the reason received from the serving node for failure to deliver the message is ~~an~~ absent subscriber_SM, ~~an~~ unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded ~~indication is received from the serving MSC, SGSN or both~~, and

- the SC address is not yet included in the MWD set, or

- the reason received from the serving node ~~(MSC or SGSN)~~ for failure to deliver the message is absent subscriber_SM, unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded, and the corresponding flag in the HLR (as indicated the information received in the MAP_INFORM_ SERVICE_CENTRE) is not set, or

- the reason received from the serving node (MSC or SGSN) for failure to deliver the message is absent subscriber_SM and the absent subscriber diagnostic is different from the absent subscriber diagnostic received in the MAP_INFORM_ SERVICE_CENTRE.

If absent subscriber diagnostic information (see 3GPP ~~TS~~ TS 23.~~140~~040 [26]) is included with the absent subscriber_SM error indication then the SMS-GMSC relays this information ~~is relayed~~ to the HLR using the ~~procedure~~ MAP_REPORT_SM_DELIVERY_STATUS service.

If there was an attempt to deliver the short message through both the MSC and the SGSN, and both delivery attempts failed with causes as described above, the SMS-GMSC reports to the HLR the two unsuccessful SMS delivery outcomes for GPRS and non GPRS ~~are sent to the HLR~~.

If there was an attempt to deliver the short message through both the MSC and the SGSN, and the first delivery failed with causes described above ~~and~~ but the second delivery succeeded, the SMS-GMSC reports to the HLR the unsuccessful and successful SMS delivery outcomes for GPRS and non GPRS ~~are sent to HLR~~.

The SMS-GMSC may also report successful delivery to the HLRwhen the first SMS delivery through the MSC was successful, if the MNRF or MCEF ~~flag~~ or both were set in the HLR.

The SMS-GMSC may also report successful delivery to the HLR when the first SMS delivery through the SGSN was successful, if the MNRG or MCEF ~~flag~~ or both were set in the HLR.

This procedure is described in detail in clause 23.5.

The SMS-GMSC maps "Unexpected data value" and ~~s~~"System failure" MAP errors from the serving node ~~are indicated as~~ to a ~~s~~"System failure" error to the SC. Other MAP errors are ~~indicated using~~mapped to appropriate cause values and diagnostic information ~~between~~ from the ~~GMSC~~SMS-GMSC ~~and~~ to the SC as described in 3GPP TS 23.040 [26] and 3GPP TS 24.011 [37].

The SMS-GMSC maps the ~~u~~"Unidentified subscriber" MAP error ~~is indicated~~ to ~~the SC as~~ an "Absent subscriber" error with diagnostic information set to ~~'~~"Unidentified subscriber"~~'~~ to the SC as described in 3GPP TS 23.040 [26].

Note that the indication~~,~~ of~~n~~ which number belongs to the SGSN and which to the MSC, received from the HLR ~~at routing information result~~in the MAP_SEND_ROUTING_INFO_FOR_SM confirm (see clause 23.3.2~~3~~) will enable the ~~GMSC~~SMS-GMSC to map the causes received from ~~the SGSN, MSC~~one or both serving nodes into the appropriate causes for non GPRS, GPRS or both, and send them to the SC and the HLR.

~~If there are more short messages to send in the Service Centre and the previous short message transfer succeeded, then the SMS-GMSC awaits the next short message.~~

The mobile terminated short message transfer procedure in the SMS-GMSC is shown in figure ~~23.3/7~~23.3/3.

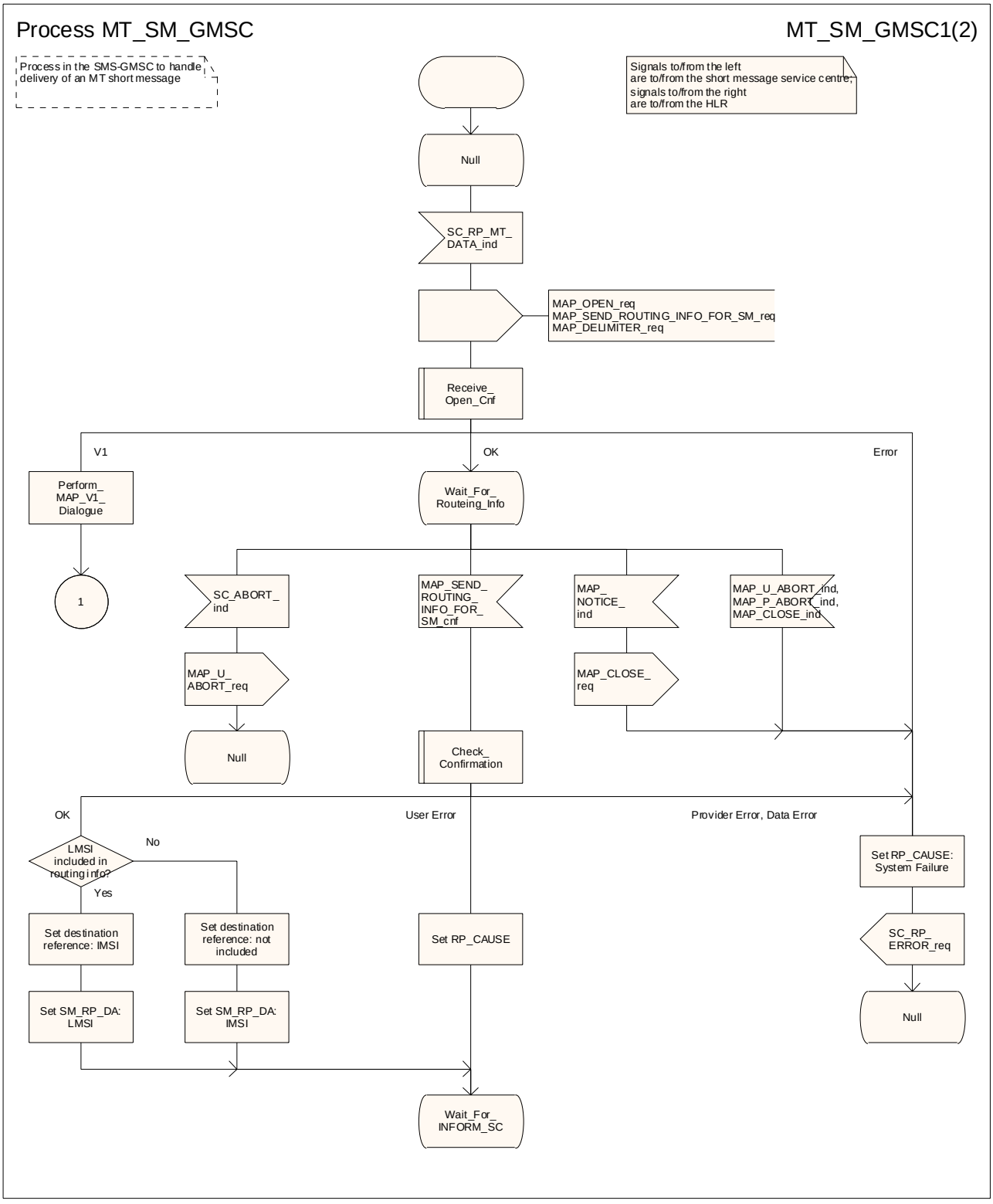


Figure ~~23.3/7~~23.3/3 (sheet 1 of 2): Process MT_SM_GMSC

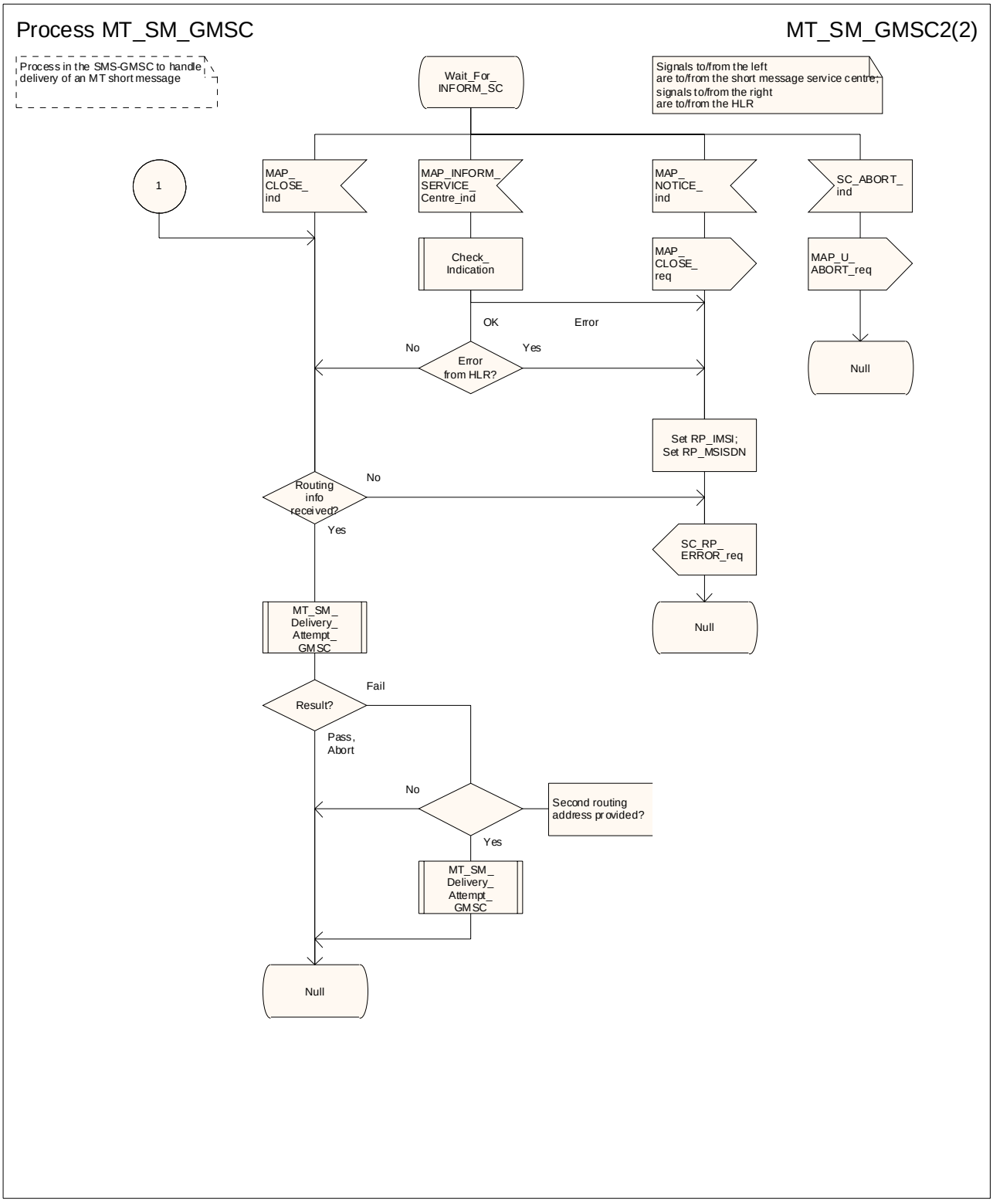


Figure ~~23.3/7~~23.3/3 (sheet 2 of 2): Process MT_SM_GMSC

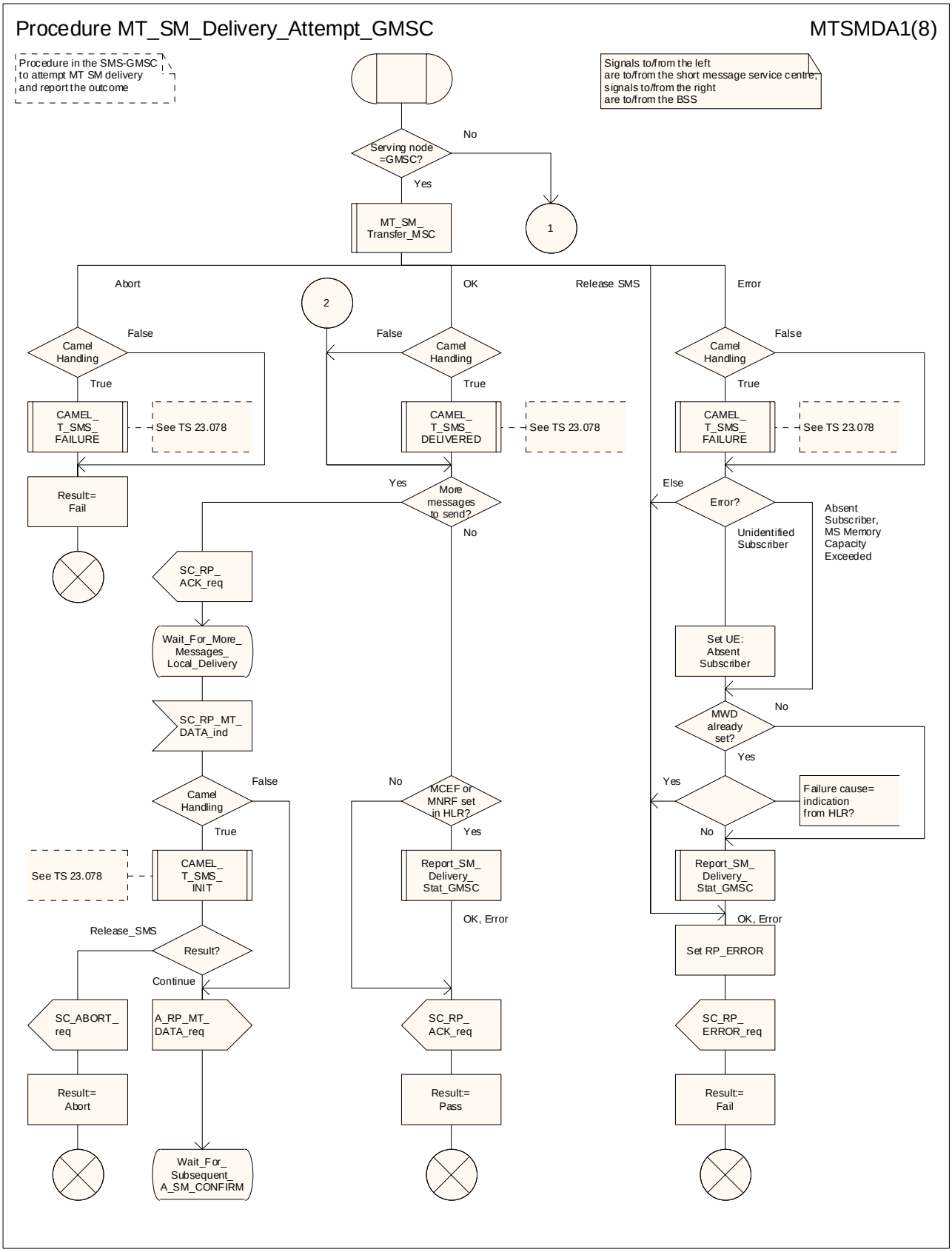


Figure ~~23.3/7a~~23.3/4 (sheet 1 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

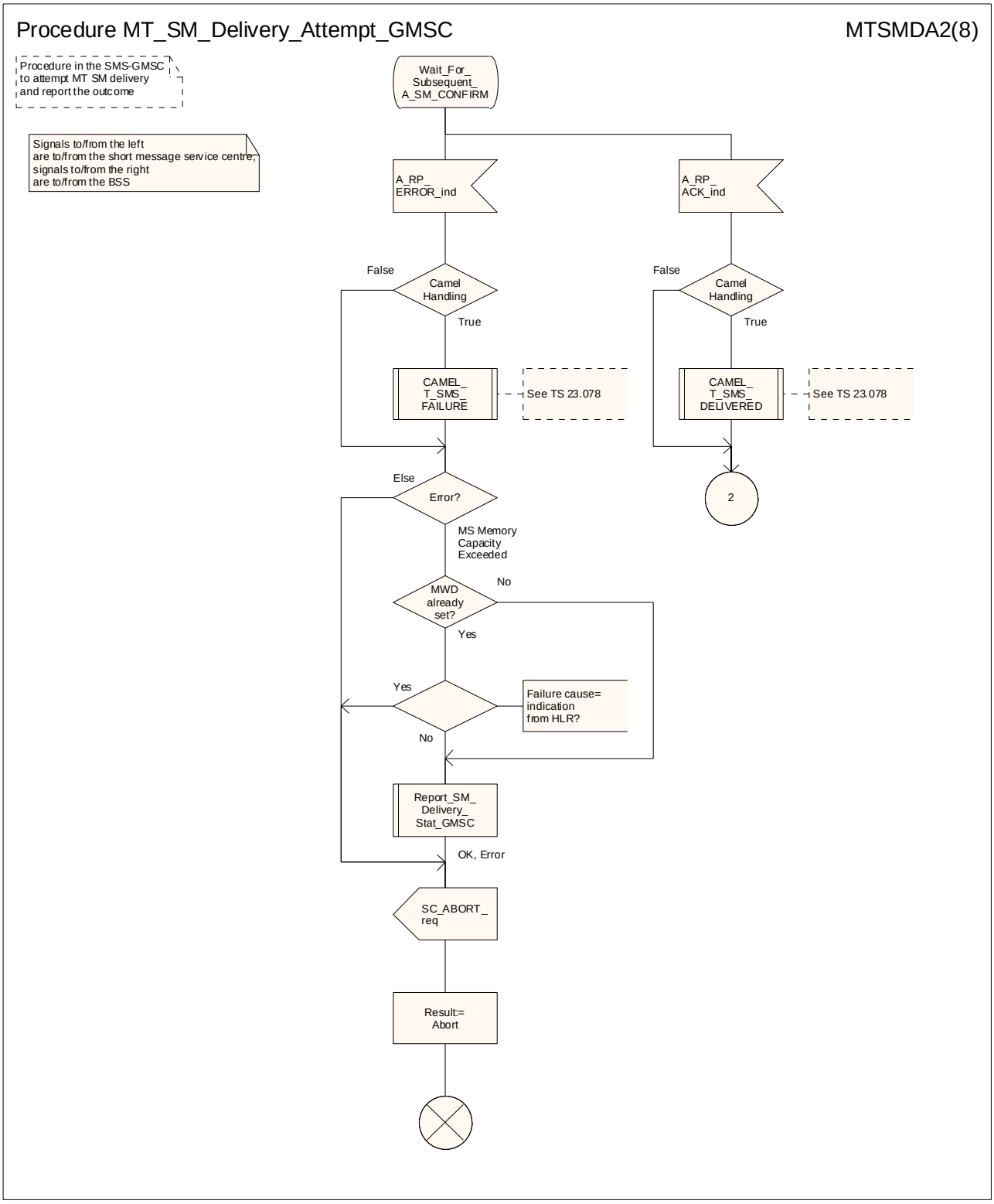
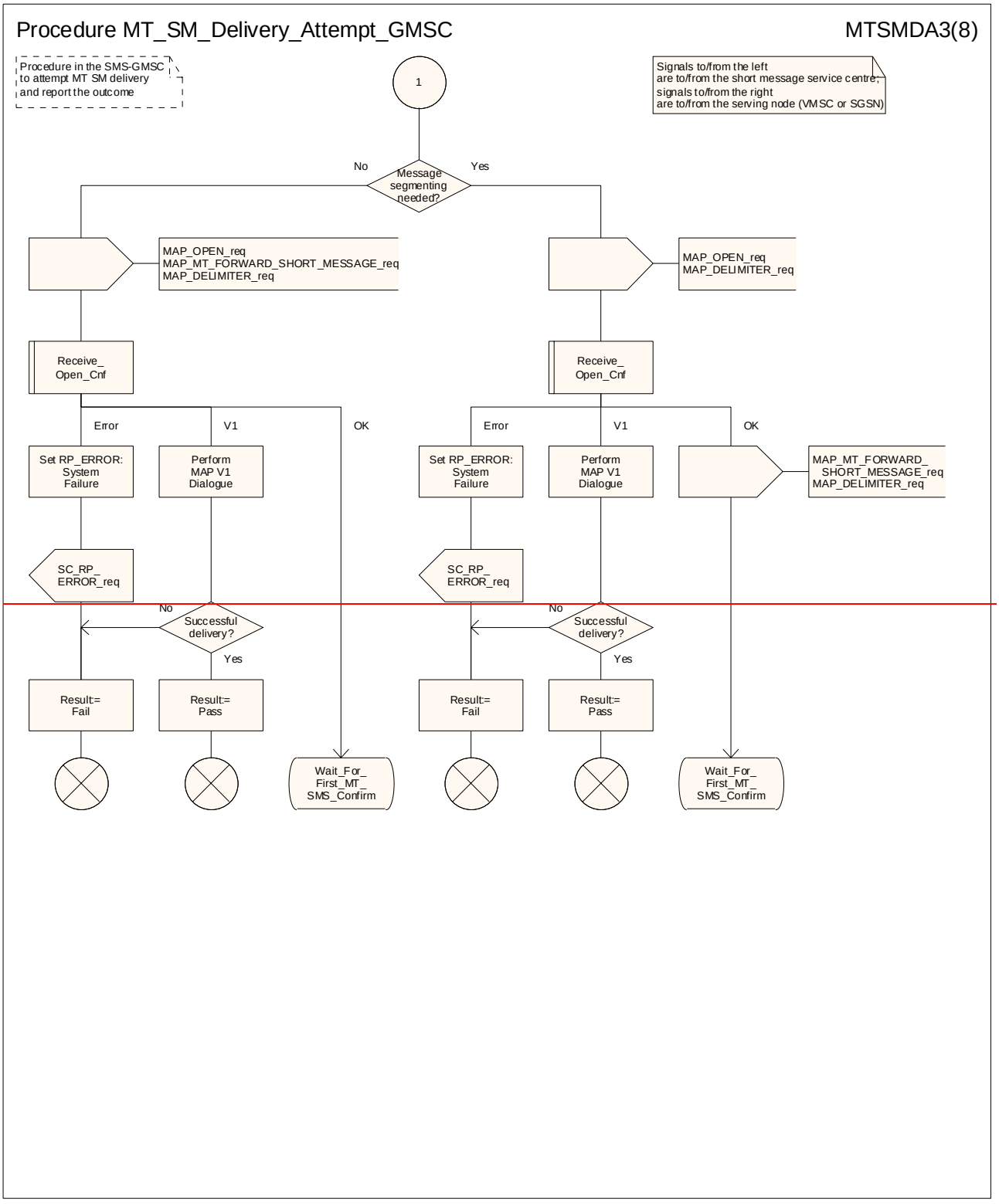


Figure ~~23.3/7a~~23.3/4 (sheet 2 of 8): Procedure MT_SM_Delivery_Attempt_GMSC


Procedure MT_SM_Delivery_Attempt_GMSC
MTSMDA3(8)
Procedure in the SMS-GMSC to attempt MT SM delivery and report the outcome
1
Signals to/from the left are to/from the short message service centre; signals to/from the right are to/from the serving node (VMSC or SGSN)
No
Message segmenting needed?
Yes
MAP_OPEN_req
MAP_MT_FORWARD_SHORT_MESSAGE_req
MAP_DELIMITER_req
MAP_OPEN_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Receive_ Open_Cnf
Error
V1
OK
Error
V1
OK
Set RP_ERROR: System Failure
Perform MAP V1 Dialogue
Set RP_ERROR: System Failure
Perform MAP V1 Dialogue
MAP_MT_FORWARD_ SHORT_MESSAGE_req
MAP_DELIMITER_req
SC_RP_ ERROR_req
SC_RP_ ERROR_req
No
Successful delivery?
No
Successful delivery?
Yes
Yes
Result:= Fail
Result:= Pass
Result:= Fail
Result:= Pass
Wait_For_ First_MT_ SMS_Confirm
Wait_For_ First_MT_ SMS_Confirm

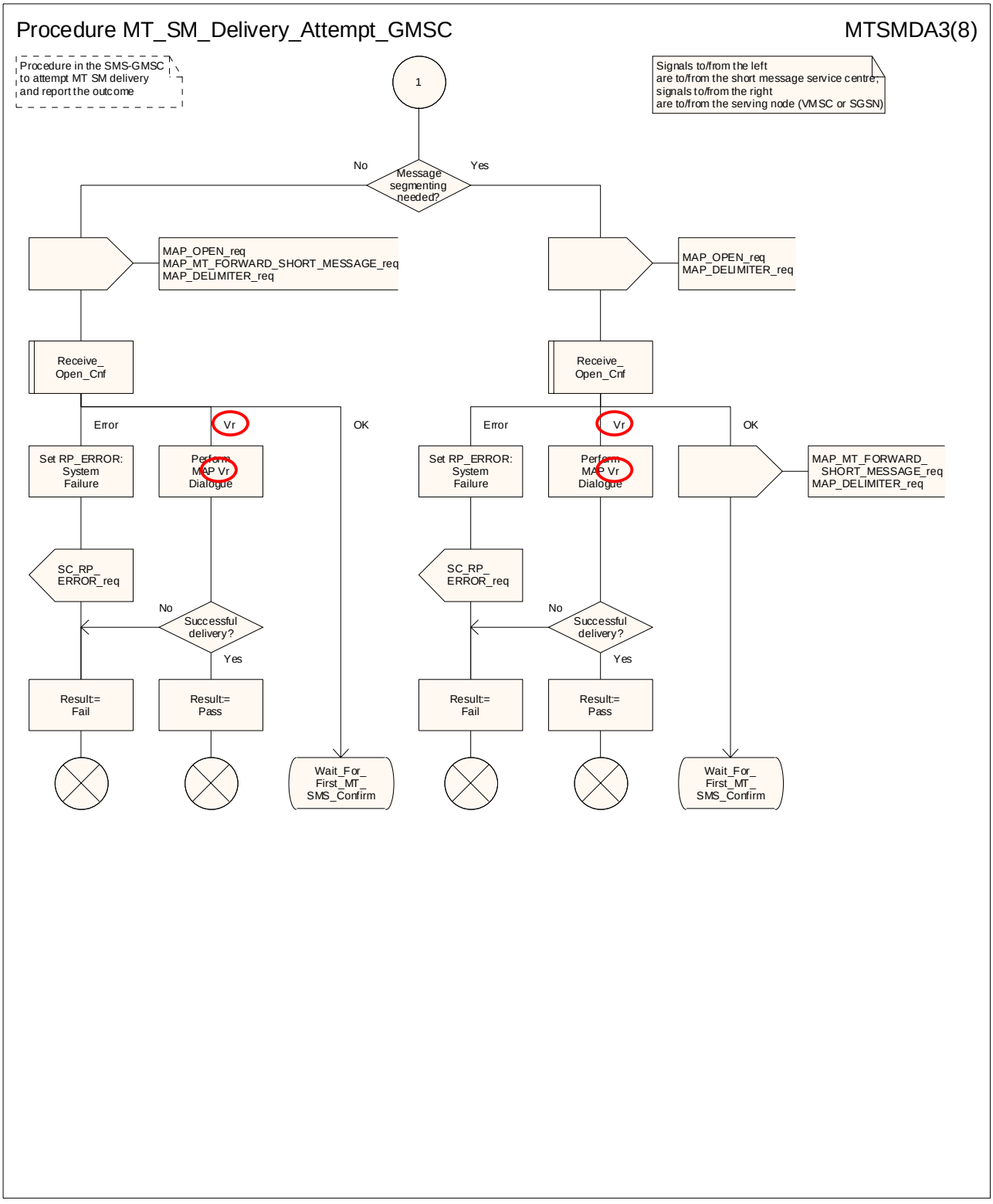


Figure ~~23.3/7a~~23.3/4 (sheet 3 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

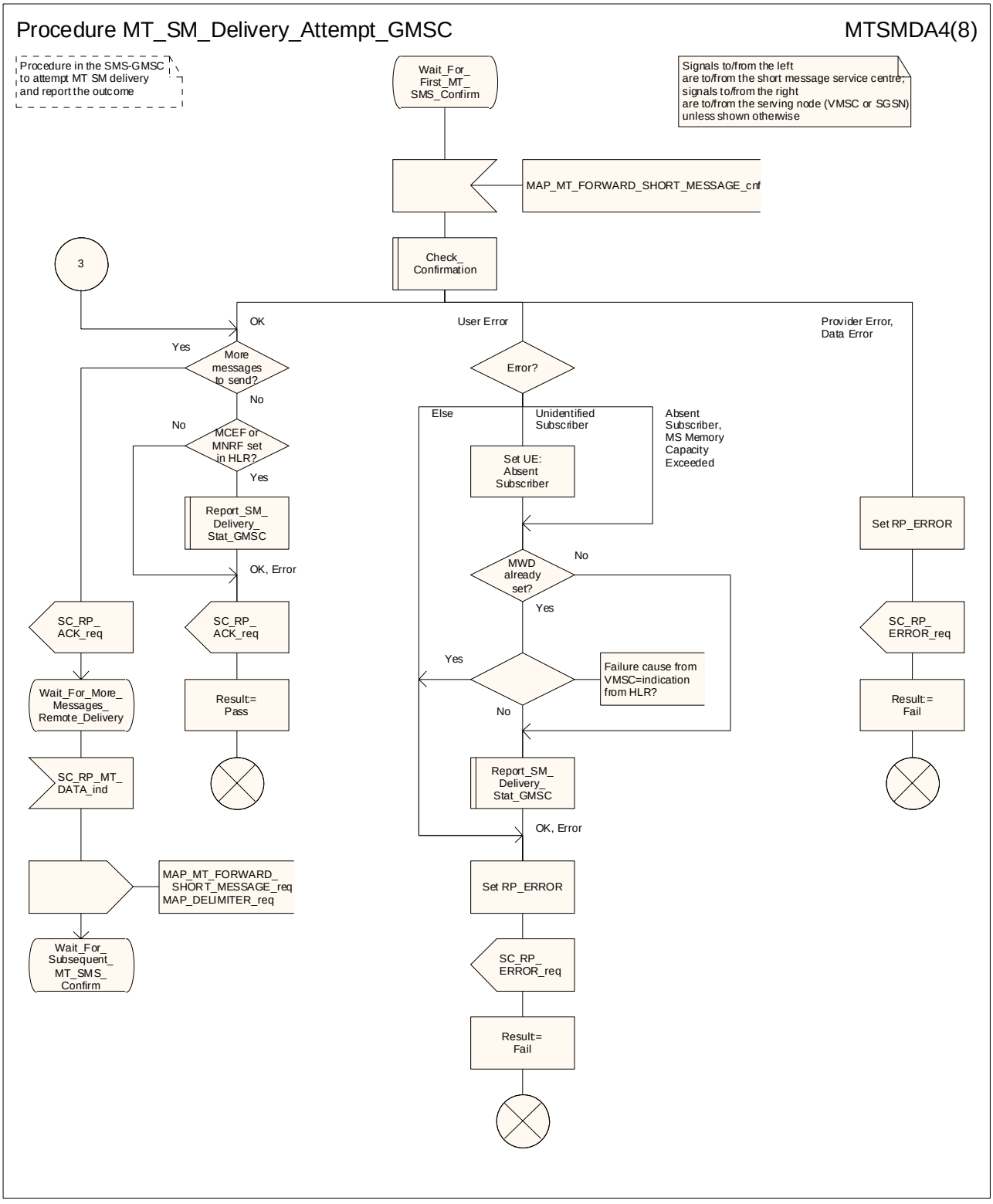
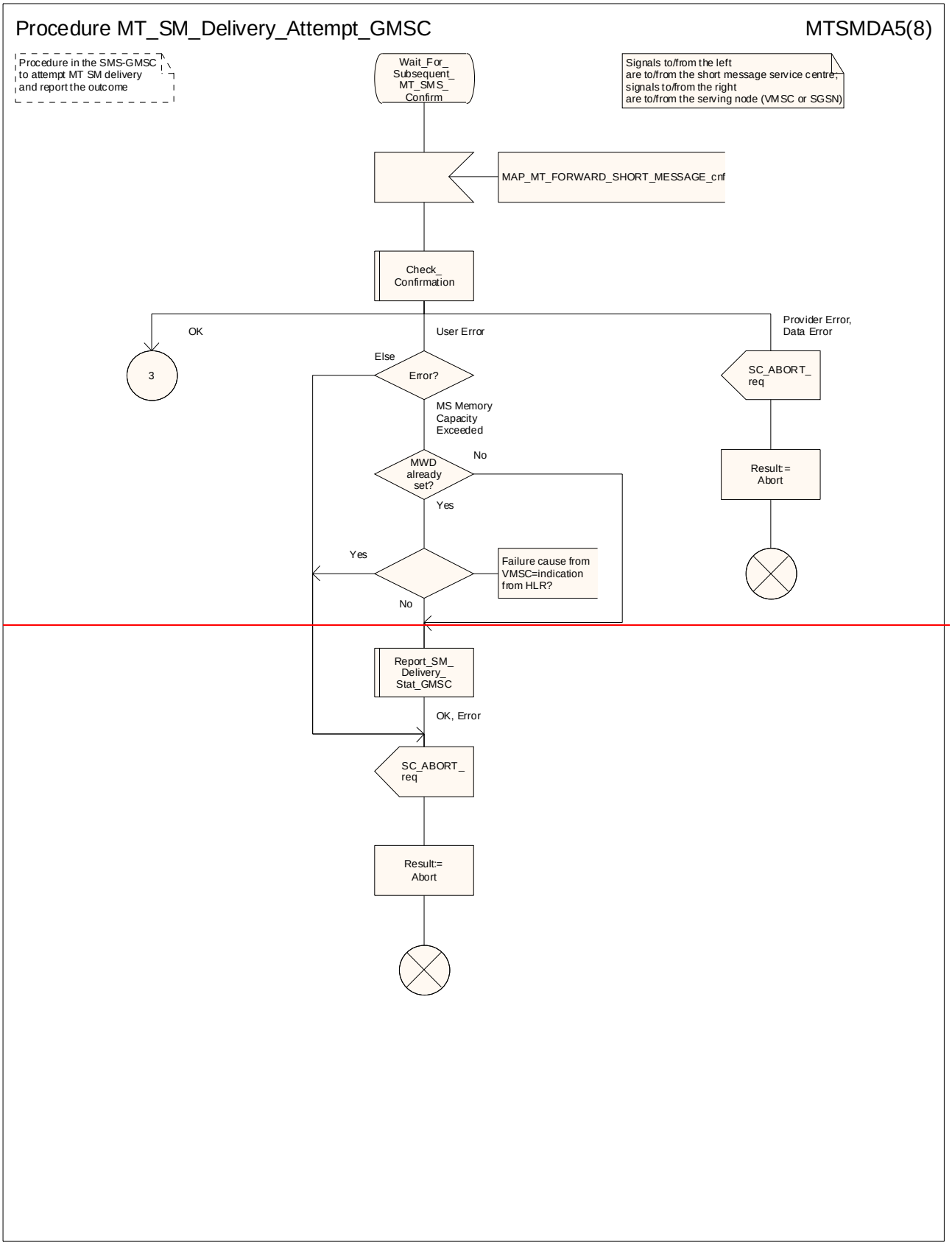
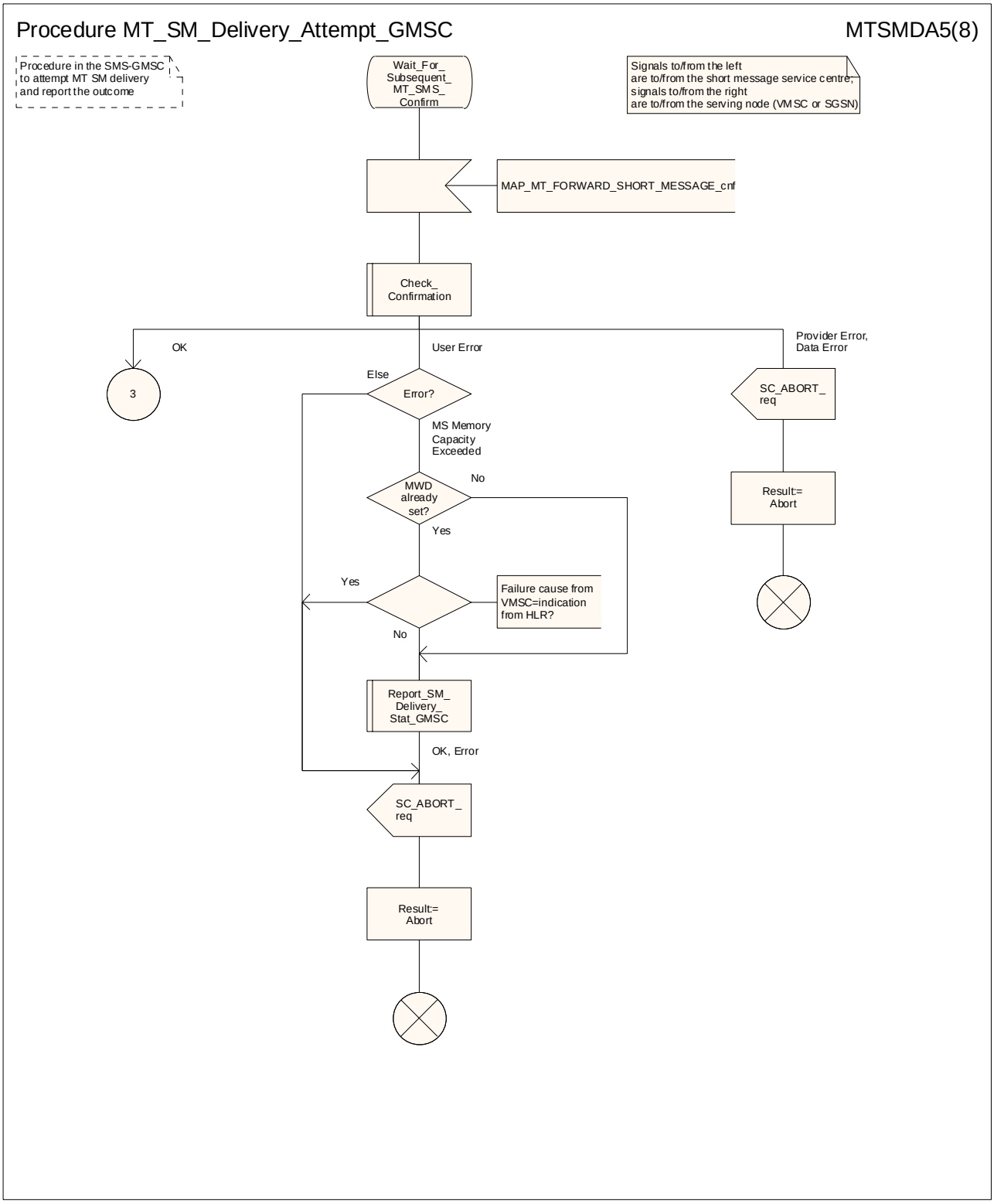


Figure ~~23.3/7a~~23.3/4 (sheet 4 of 8): Procedure MT_SM_Delivery_Attempt_GMSC


Procedure MT_SM_Delivery_Attempt_GMSC
MTSMDA5(8)
Procedure in the SMS-GMSC to attempt MT SM delivery and report the outcome
Wait_For_ Subsequent_ MT_SMS_ Confirm
Signals to/from the left are to/from the short message service centre; signals to/from the right are to/from the serving node (VMSC or SGSN)
MAP_MT_FORWARD_SHORT_MESSAGE_cnf
Check_ Confirmation
OK
User Error
Provider Error, Data Error
3
Else
Error?
SC_ABORT_ req
MS Memory Capacity Exceeded
MWD already set?
No
Result:= Abort
Yes
Yes
Failure cause from VMSC=indication from HLR?
No
Report_SM_ Delivery_ Stat_GMSC
OK, Error
SC_ABORT_ req
Result:= Abort



CR editor's note: the only change to this sheet is the size of the frame!

Figure ~~23.3/7a~~23.3/4 (sheet 5 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

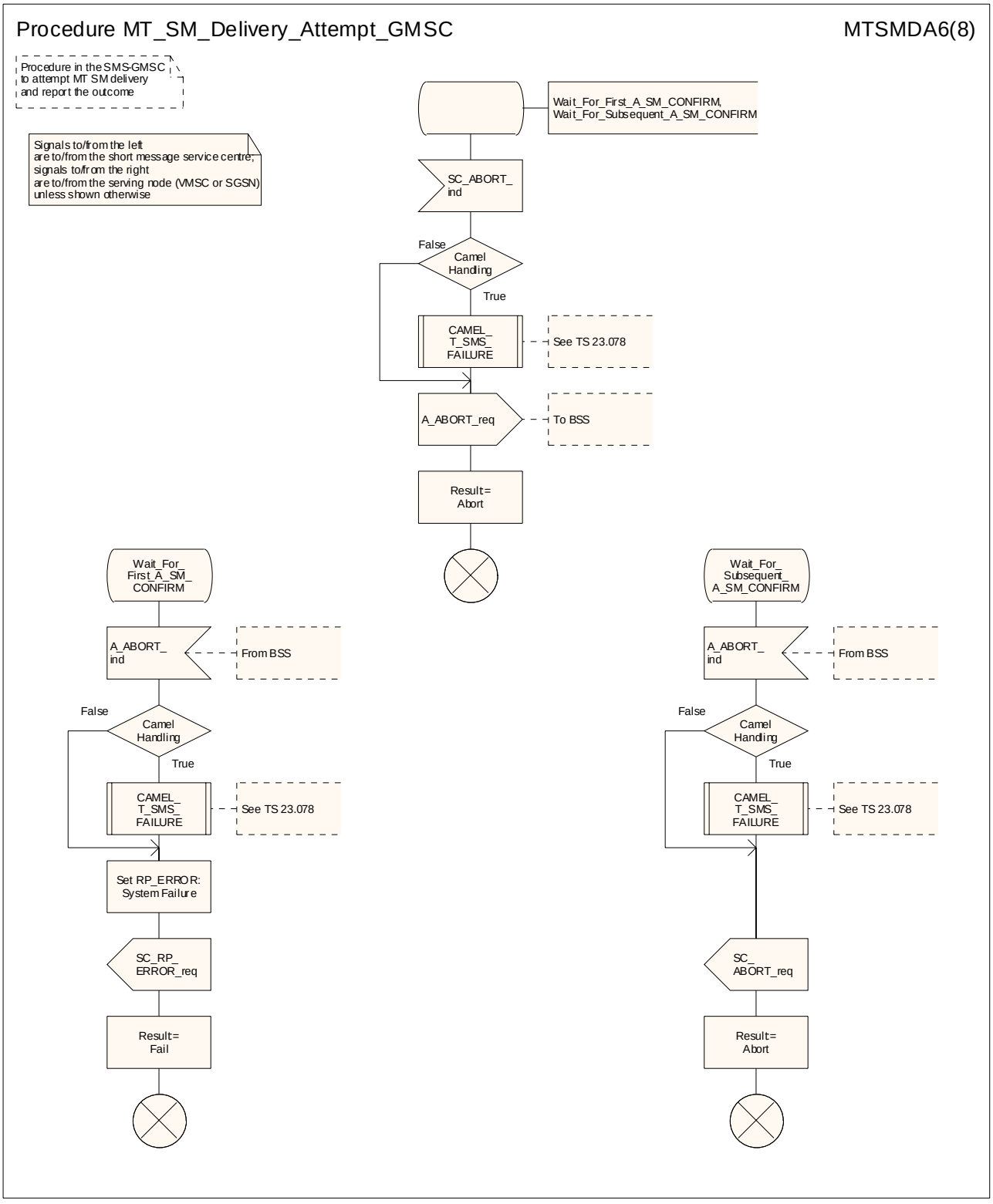
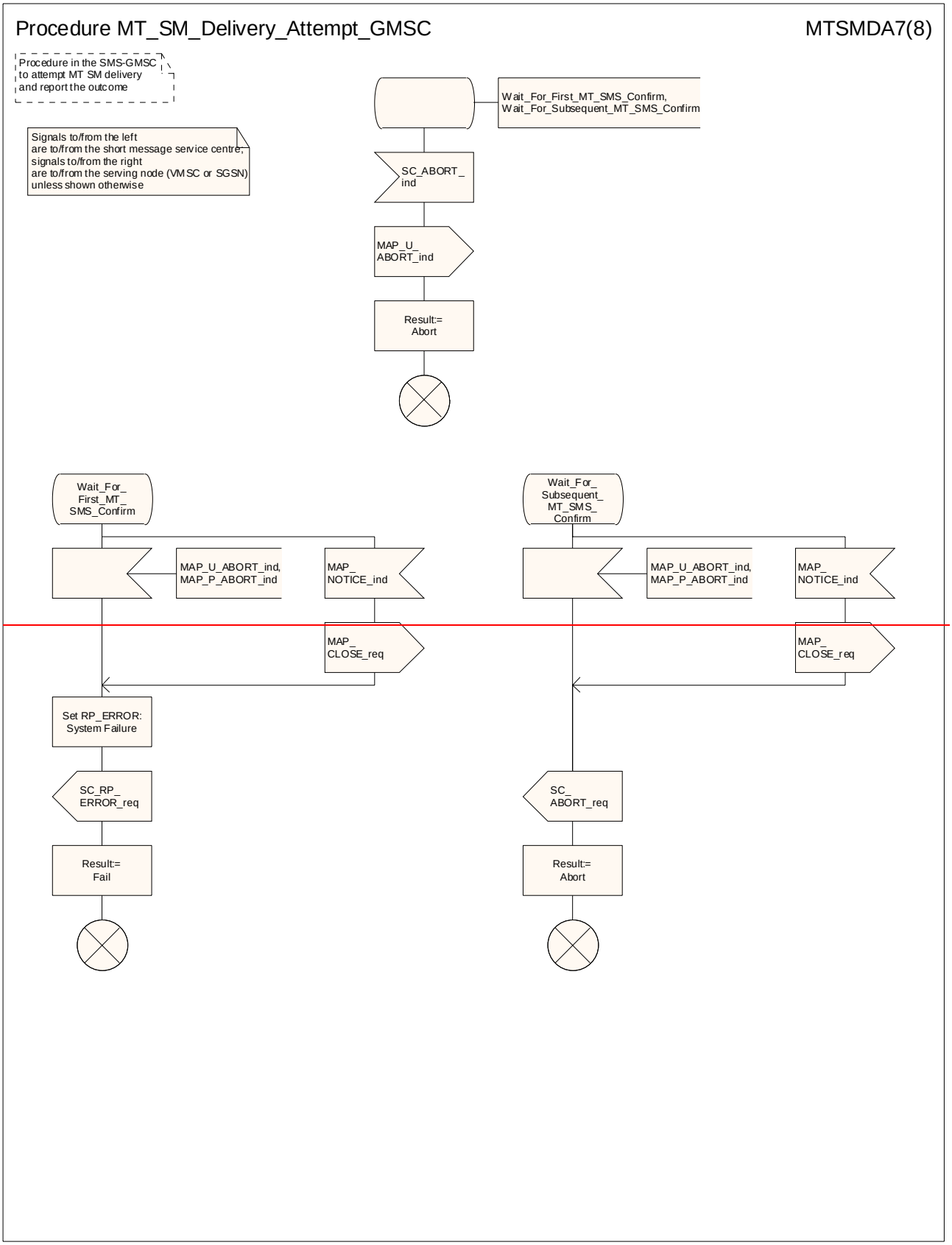
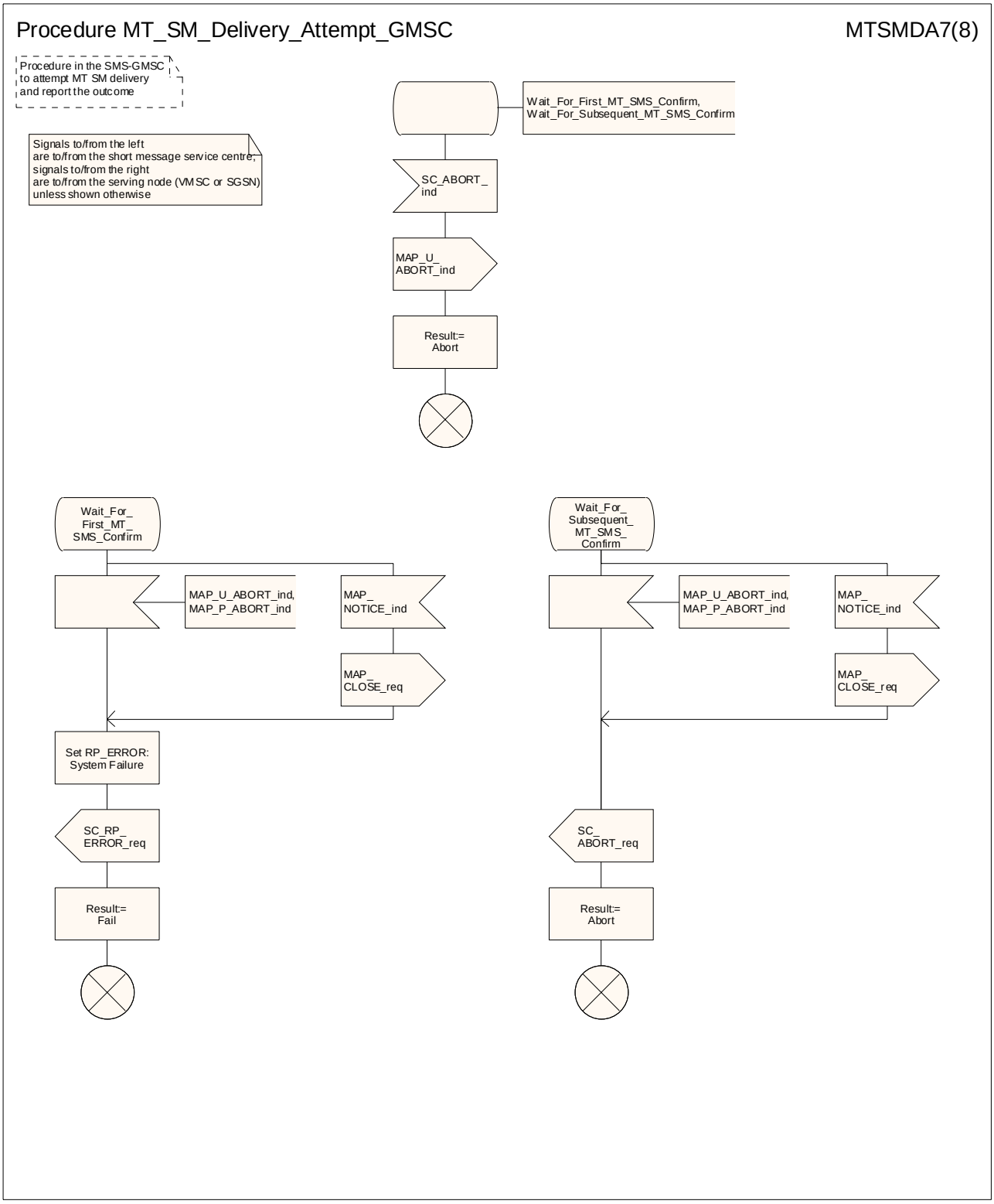


Figure ~~23.3/7a~~23.3/4 (sheet 6 of 8): Procedure MT_SM_Delivery_Attempt_GMSC


Procedure MT_SM_Delivery_Attempt_GMSC
MTSMDA7(8)
Procedure in the SMS-GMSC to attempt MT SM delivery and report the outcome
Signals to/from the left are to/from the short message service centre; signals to/from the right are to/from the serving node (VMSC or SGSN) unless shown otherwise
Wait_For_First_MT_SMS_Confirm, Wait_For_Subsequent_MT_SMS_Confirm
SC_ABORT_ ind
MAP_U_ ABORT_ind
Result:= Abort
Wait_For_ First_MT_ SMS_Confirm
MAP_U_ABORT_ind, MAP_P_ABORT_ind
MAP_ NOTICE_ind
MAP_ CLOSE_req
Set RP_ERROR: System Failure
SC_RP_ ERROR_req
Result:= Fail
Wait_For_ Subsequent_ MT_SMS_ Confirm
MAP_U_ABORT_ind, MAP_P_ABORT_ind
MAP_ NOTICE_ind
MAP_ CLOSE_req
SC_ ABORT_req
Result:= Abort



CR editor's note: the only change to this sheet is the size of the frame!

Figure ~~23.3/7a~~23.3/4 (sheet 7 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

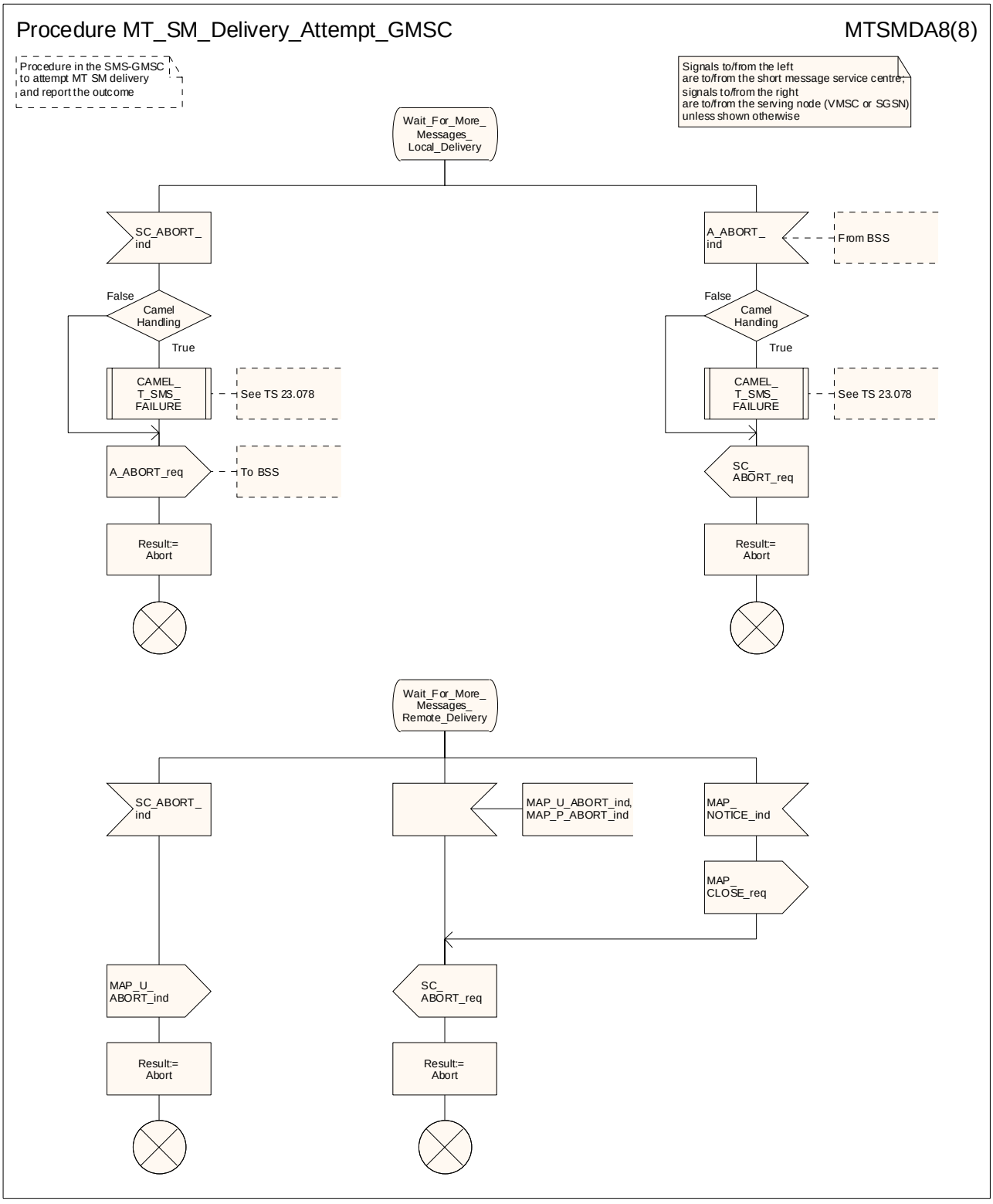


Figure ~~23.3/7a~~23.3/4 (sheet 8 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

23.3.2~~3~~ Procedures in the HLR

The process is triggered by a MAP_SEND_ROUTING_INFO_FOR_SM indication from the SMS-GMSC. For any of the following error cases, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the appropriate user error, closes the dialogue and terminates the process:

~~The MAP_SEND_ROUTING_INFO_FOR_SM indication is received from the GMSC. The following error cases are reported to the GMSC in the MAP_SEND_ROUTING_INFO_FOR_SM response as an unsuccessful outcome of the procedure:~~

- if the indication is badly formed, the HLR returns the appropriate User Error;
- if the mobile subscriber is unknown, i.e. it cannot be identified from the MSISDN given, the HLR returns the User Error "Unknown subscriber";
- if the subscription does not include the MT SMS teleservice, the HLR returns the User Error "Teleservice not provisioned";
- if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";
- if the short message transfer would contravene the "SM filtering by the HPLMN" function criteria, the HLR returns the User Error "Call barred" with cause "Unauthorised Message Originator". The definition of the filtering function is out of the scope of UMTS specifications. Filtering may be based on the SM-RP-SMEA information element if it is received from the SMS-GMSC;
- depending on the Network Access Mode ("Non-GPRS", "GPRS" or "Non-GPRS and GPRS"), the HLR behaves as follows:
  - if the Network Access Mode is "Non-GPRS", i.e. the subscriber is not a GPRS subscriber, then:
    - if the MS is not reachable in an MSC, i.e. no MSC identity is stored for the mobile subscriber or the "MSC Area Restricted Flag" is set or the "MS purged for non GPRS" flag is set, the HLR sets the MNRF and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic, i.e. "Deregistered in HLR for non GPRS", "Roaming Restricted" or "MS-Purged for non GPRS". The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";
    - if the MSC where the subscriber is registered does not support MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;
    - if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";
    - if the short message transfer would contravene supplementary service barring, the HLR returns the User Error "Call barred" with cause "Barring service active";
    - if the MNRF is set, the HLR checks whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication. If the priority information element was present, the HLR sets the "mnrf-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true". If the priority information element was not present, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for non-GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";
    - if the MNRF is not set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".
  - if the Network Access Mode is "GPRS", i.e. the subscriber is a GPRS subscriber, then:

- if the MS is not reachable in an SGSN, i.e. no MSC identity is stored for the mobile subscriber or the "SGSN Area Restricted Flag" is set or the "MS purged for GPRS" flag is set, the HLR sets the MNRG flag and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the SGSN where the subscriber is registered does not support MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;

- if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";

- if the MNRG flag is set, the HLR checks whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication. If the priority information element was present, the HLR sets the "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. If the SMS-GMSC did not indicate in the MAP_SEND_ROUTING_INFO_FOR_SM indication that it supports GPRS functionality (i.e. it can handle two routeing addresses in the MAP_SEND_ROUTING_INFO_FOR_SM response), the HLR maps the state of the MNRG flag into the "mnrf-Set" bit of the mw-Status parameter.

NOTE: If the SMS-GMSC does not support GPRS functionality, it uses the protocol defined in the Release 96 version of the specification. The parameter "msc-Number" in "RoutingInfoForSM-Res" in the Release 96 version of the protocol definition corresponds to the parameter "networkNode-Number" in "RoutingInfoForSM-Res" in the Release 97 (and later) version of the protocol definition; therefore if the HLR populates the parameter "networkNode-Number" with the SGSN number, the Release 96 SMS-GMSC will interpret the SGSN number as an MSC number. If the HLR populates the "gprsNodeIndicator" parameter in the MAP_SEND_ROUTING_INFO_FOR_SM response, a Release 96 SMS-GMSC will silently discard the parameter.

The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the priority information element was not present, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the MNRG flag is not set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".

- if the Network Access Mode is "Non-GPRS and GPRS", i.e. the subscriber is a non-GPRS and GPRS subscriber, then:

- the HLR checks whether the SMS-GMSC supports GPRS functionality, i.e. it can handle two routeing addresses in the MAP_SEND_ROUTING_INFO_FOR_SM response;

- if the SMS-GMSC does not support GPRS functionality then:

- if the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the MSC", the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

- if the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the SGSN", the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS".

- if the SMS-GMSC supports GPRS functionality then:

- if the MS is not reachable in an MSC (see the definition above under Network Access Mode "Non-GPRS") and not reachable in an SGSN (see the definition above under Network Access Mode

"GPRS"), the HLR sets the MNRF and the MNRG flag and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the MS is not reachable in an SGSN (see the definition above under Network Access Mode "GPRS") but is reachable in an MSC, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

- if the MS is not reachable in an MSC (see the definition above under Network Access Mode "Non-GPRS") but is reachable in an SGSN, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS";

- if the MS is reachable in both an MSC and an SGSN, the HLR continues as described below;

- if neither the MSC nor the SGSN where the subscriber is registered supports MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;

- if only the MSC where the subscriber is registered supports MT SMS, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

- if only the SGSN where the subscriber is registered supports MT SMS, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS";

- if both the MSC and the SGSN where the subscriber is registered support MT SMS, the HLR checks whether the short message transfer would contravene operator determined barring or supplementary service barring.

- if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";

- if the short message transfer would contravene supplementary service barring, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

NOTE: supplementary service barring is specified to apply only for SMS transfer via an MSC, not for SMS transfer via an SGSN.

- if the short message transfer is not prevented by operator determined barring or supplementary service barring, the HLR checks the states of the MNRF and the MNRG flag, and whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication.

- if both the the MNRF and the MNRG flag are set and the priority information element was absent, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for non-GPRS or GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if one or both of the MNRF and the MNRG flag is set and the priority information element was present, the HLR sets the "mnrf-Set", "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number and SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the MNRG flag is set but the the priority information element was absent, the HLR sets the "mnrf-Set", "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the

MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the MNRF is set but the the priority information element was absent, the HLR sets the "mnrf-Set", "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if neither the MNRF nor the MNRG flag is set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number and SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".

Addition of the Service Centre Address to the MWD list

The HLR checks whether the service centre address is included in the Message Waiting Data (MWD) list.

- if the service centre address is not in the MWD list, the HLR attempts to add the service centre address. If it was not possible to add the service centre address to the MWD list (e.g. because the MWD list was full), the HLR sets the MWD status to show that the service centre address was not included, otherwise the HLR sets the MWD status to show that the service centre address was included;

- if the service centre address is in the MWD list, the HLR sets the MWD status to show that the service centre address was included.

The HLR then checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request.

The HLR then sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

Return of Routeing Information because the SM-RP-Priority is true

The HLR checks whether the service centre address is included in the Message Waiting Data (MWD) list.

- if the service centre address is not in the MWD list, the HLR sets the MWD status to show that the service centre address was not included;

- if the service centre address is in the MWD list, the HLR sets the MWD status to show that the service centre address was included.

The HLR then checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request.

The HLR then sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

Return of Routeing Information – normal case

The HLR checks the MCEF.

- if the MCEF is set, the HLR:

  - sets the "mcef-Set" bit of the mw-Status parameter;

  - checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request;

  - sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

- if the MCEF is not set, the HLR:

- checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sends to the SMS-GMSC a MAP_INFORM_SERVICE_CENTRE request including the MSISDN-Alert parameter;

- closes the MAP dialogue and terminates the process.

Use of LMSI

If the HLR received a LMSI from the VLR at location updating, it shall include the LMSI in the MAP_SEND_ROUTING_INFO_FOR_SM response only if the MAP_SEND_ROUTING_INFO_FOR_SM response also includes the MSC number.

- ~~if the necessary parameters and data are not present in the primitive or they are badly formatted, the data missing or unexpected data value error is returned;~~

- ~~if the mobile subscriber is unknown, i.e. it cannot be identified from the MSISDN given, an unknown subscriber error is returned;~~

- ~~if the short message transfer would contravene operator determined barring, the call barred error with cause operator barring is returned;~~

- ~~if the short message transfer would contravene the « SM filtering by the HPLMN » function criteria, the call barred error with cause unauthorised Message Originator is returned (the definition of the filtering function is out of the scope of GSM specification. Filtering may be based on SM-RP-SMEA information element if received from the GMSC);~~

- ~~if the mobile subscription identified by the given MSISDN number does not include the short message service, the teleservice not provisioned error is returned;~~

- ~~if the GMSC does not support the GPRS functionality, the behaviour of the HLR depends on the following conditions:~~

  - ~~if the subscriber is not a GPRS subscriber then the behaviour of the HLR shall be the same as for a subscriber only registered as non GPRS and for SMS delivery;~~

  - ~~if the subscriber is a GPRS subscriber and a non GPRS subscriber with the option « transfer of SM via the MSC when GPRS is not supported in the GMSC » then the behaviour of the HLR shall be the same as for a subscriber only registered as non GPRS and for SMS delivery;~~

  - ~~if the subscriber is a GPRS subscriber and a non GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only then the behaviour of the HLR shall be the same as for the case transfer over GPRS described in MAP release 97, with the following precision: because GMSC does not support MAP release 97, the previous MAP protocol release is used. When the HLR sends the MAP_SEND_ROUTING_INFO_FOR_SM_Resp, the SGSN number is mapped to the MAP parameter « MSC number ». When the HLR sends the MAP_INFORM_SERVICE_CENTRE_resp, the MNRG status shall be mapped to the MAP parameter « mnrf set ».~~

~~The HLR may send the MSC, SGSN or both numbers as routing information to SMS-GMSC based on the following:~~

~~A) The subscriber may only be registered as non GPRS and for SMS delivery:~~

- ~~if the short message transfer would contravene the supplementary service barring, the call barred error with cause barring service active is returned;~~

- ~~if the location registration of the mobile subscriber shows that the VLR in the visited PLMN does not support the MT short message service, the facility not supported error is returned;~~

- ~~if no MSC identity is stored for the mobile subscriber or the "MSC Area Restricted Flag" is set or the "MS purged for non GPRS" flag is set, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flag MNRF is set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for non GPRS ', 'Roaming Restricted' or 'MS Purged for non GPRS '.~~

The priority parameter (SM_RP_PRI) is processed as follows:

- if the priority is low (SM_RP_PRI = False) and the mobile station not reachable flag (MNRF) is set, an absent subscriber_SM error is returned. If a reason for the subscriber's absence for non GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, then this is returned with the absent subscriber_SM error. The SC address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.

- if the priority is low (SM_RP_PRI = False), and the MNRF is clear, the routing information with MSC number is retrieved as described below;

- if the priority is high (SM_RP_PRI = True) and the MNRF is set, the HLR will send the acknowledge primitive containing the routing information with MSC number to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.

B) The subscriber may only be registered as GPRS and for SMS delivery:

- if the location registration of the mobile subscriber shows that the SGSN in the visited PLMN does not support the MT short message service, the facility not supported error is returned;

- if no SGSN identity is stored for the mobile subscriber or the "SGSN Area Restricted Flag" is set or the "MS purged for GPRS" flag is set, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flag MNRG is set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for GPRS', 'Roaming Restricted' or 'MS Purged for GPRS '.

The priority parameter (SM_RP_PRI) is processed as follows:

- if the priority is low (SM_RP_PRI = False) and the mobile station not reachable for GPRS (MNRG) flag is set, an absent subscriber_SM error is returned. If a reason for the subscriber's absence for GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, then this is returned with the absent subscriber_SM error. The SC address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.

- if the priority is low (SM_RP_PRI = False), and the MNRG is clear, the routing information with SGSN number is retrieved as described below;

- if the priority is high (SM_RP_PRI = True) and the MNRG is set, the HLR will send the acknowledge primitive containing the routing information with SGSN number to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.

C) The subscriber may be registered as non GPRS and GPRS and for SMS Delivery:

- if the short message transfer would contravene the supplementary service barring, the behaviour is the same as for a subscriber only registered for GPRS and SMS delivery.

- if the location registration of the mobile subscriber shows that the VLR in the visited PLMN does not support the MT short message service, the behaviour is the same as for a subscriber only registered for GPRS and SMS delivery;

- if the location registration of the mobile subscriber shows that the SGSN in the visited PLMN does not support the MT short message service, the behaviour is the same as for a subscriber only registered for non GPRS and SMS delivery;

- if no MSC and SGSN identities are stored for the mobile subscriber or the "MSC and SGSN Area Restricted Flags" are set or the "MS purged for non GPRS and GPRS" flags are set or a combination of these errors for non GPRS and GPRS are used, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flags MNRF and MNRG are set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for non GPRS or GPRS', 'Roaming Restricted', 'MS Purged for non GPRS or GPRS' or both.

~~The priority parameter (SM_RP_PRI) is processed as follows:~~

- ~~if the priority is low (SM_RP_PRI = False), the MNRF and MNRG are set, an absent subscriber_SM error is returned. If reasons for the subscriber's absence for non GPRS and GPRS are stored in MNRR in the subscriber data, then this is returned with the absent subscriber_SM error. The SC address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.~~

- ~~if the priority is low (SM_RP_PRI = False), and the MNRF is clear and MNRG is set, the routing information with MSC number is retrieved as described below;~~

- ~~if the priority is low (SM_RP_PRI = False), and the MNRF is set and MNRG is clear, the routing information with SGSN number is retrieved as described below;~~

- ~~if the priority is low (SM_RP_PRI = False), and the MNRF and MNRG are clear, the routing information with MSC and SGSN numbers is retrieved as described below;~~

- ~~if the priority is high (SM_RP_PRI = True) and the MNRF, the MNRG or both are set, the HLR will send the acknowledge primitive containing the routeing information with both MSC and SGSN numbers to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.~~

~~If the MSISDN-Alert number of the mobile subscriber stored in the MWD is not the same as that received in the MAP_SEND_ROUTING_INFO_FOR_SM indication, the HLR will include in the MAP_INFORM_SERVICE_CENTRE request to the GMSC the MSISDN-Alert number stored.~~

~~The MAP_INFORM_SERVICE_CENTRE request is sent also when the MCEF, MNRF, MNRG or both are set but the routing information is still sent to the GMSC. The status of the flags is indicated in the parameter MW Status.~~

~~The routing information is included in a MAP_SEND_ROUTING_INFO_FOR_SM response as follows:~~

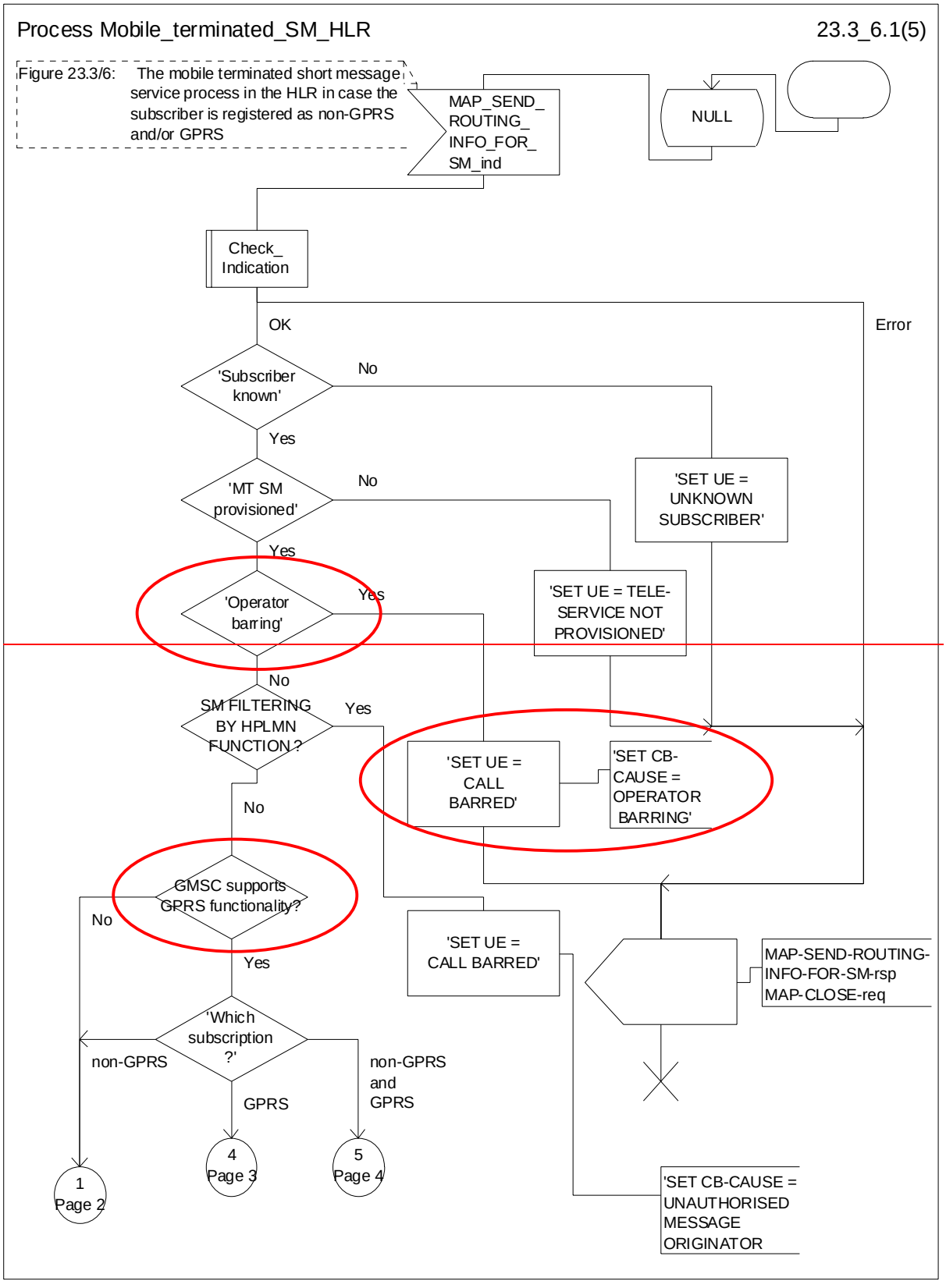
- ~~the IMSI will be returned to the GMSC together with the MSC, SGSN or both numbers and may be optionally accompanied by the LMSI.~~

- ~~an indication specifying which number belongs the MSC and the SGSN will be returned to the GSMC.~~

~~LMSI shall not be used in case only the SGSN number is sent by HLR.~~

The mobile terminated short message transfer proces~~s~~s~~dure~~ in the HLR is shown in figure 23.3/5~~6~~.

CR editor's note: the material in the SDL diagrams has undergone major **editorial** rearrangement. The handling of the output signals on the old sheets 2, 3 & 4 has been moved to the new sheet 4, together with the handling on the old sheet 5. The intention of this rearrangement is to improve the presentation, with no technical impact.


Process Mobile_terminated_SM_HLR
23.3_6.1(5)
Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS
MAP_SEND_ROUTING_INFO_FOR_SM_ind
NULL
Check_Indication
OK
Error
'Subscriber known'
No
Yes
'MT SM provisioned'
No
Yes
'SET UE = UNKNOWN SUBSCRIBER'
'Operator barring'
Yes
'SET UE = TELE-SERVICE NOT PROVISIONED'
No
SM FILTERING BY HPLMN FUNCTION ?
Yes
'SET UE = CALL BARRED'
'SET CB-CAUSE = OPERATOR BARRING'
No
GMSC supports GPRS functionality?
No
Yes
'SET UE = CALL BARRED'
MAP-SEND-ROUTING-INFO-FOR-SM-rsp
MAP-CLOSE-req
'Which subscription ?'
non-GPRS
GPRS
non-GPRS and GPRS
1 Page 2
4 Page 3
5 Page 4
'SET CB-CAUSE = UNAUTHORISED MESSAGE ORIGINATOR

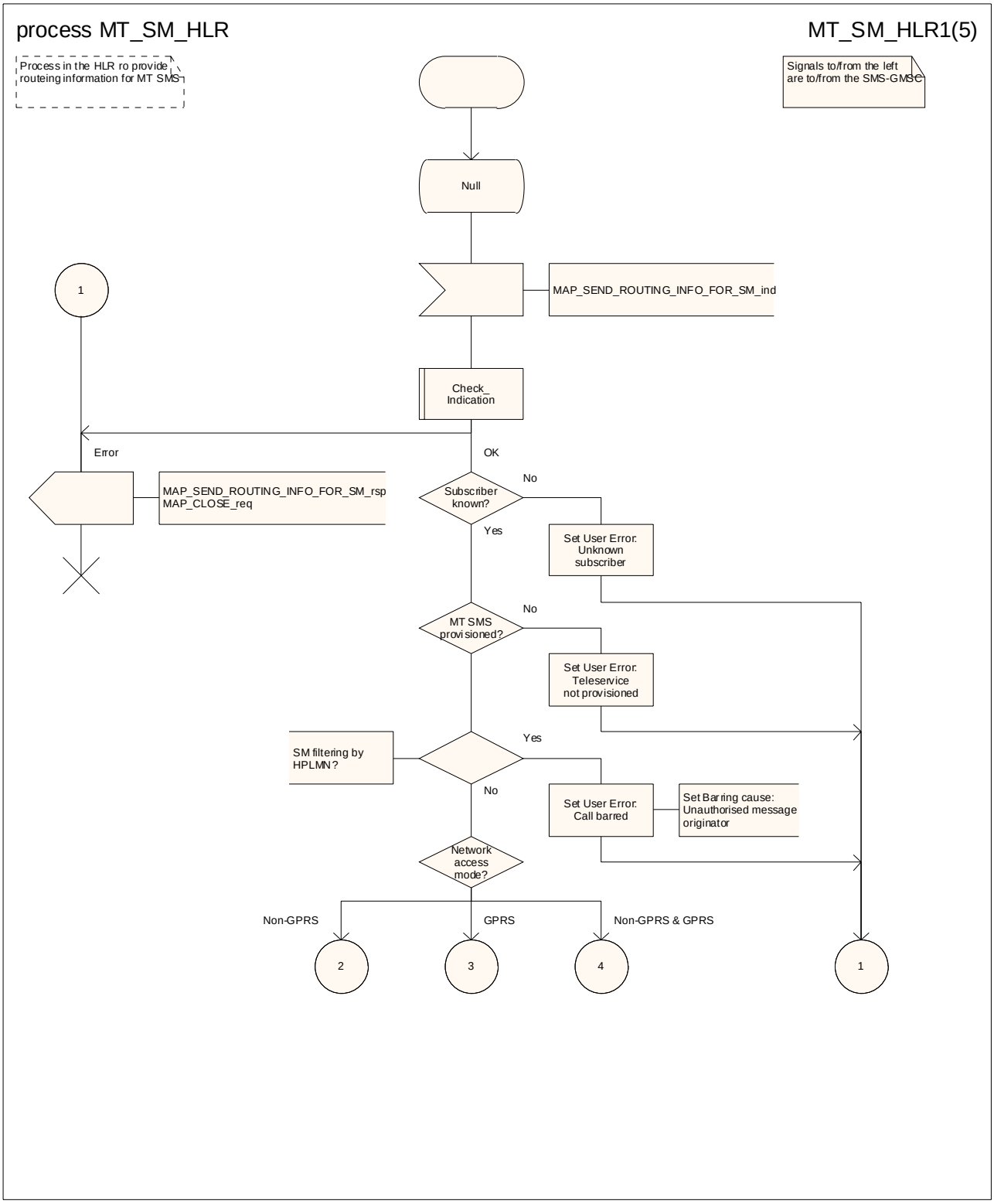


Figure 23.3/5~~6~~ (sheet 1 of 5): Process MT~~obile_terminated~~ _SM_HLR

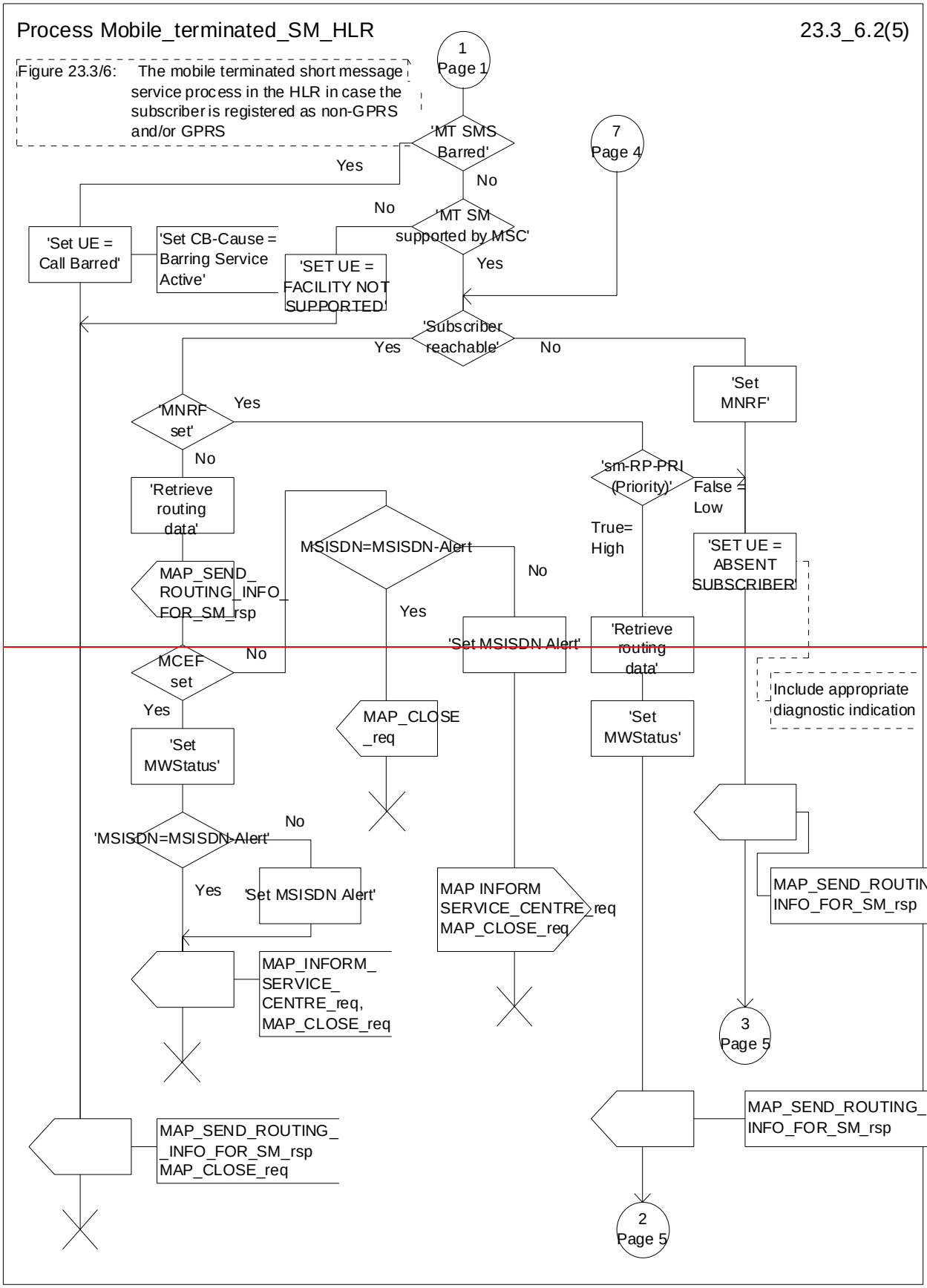


Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

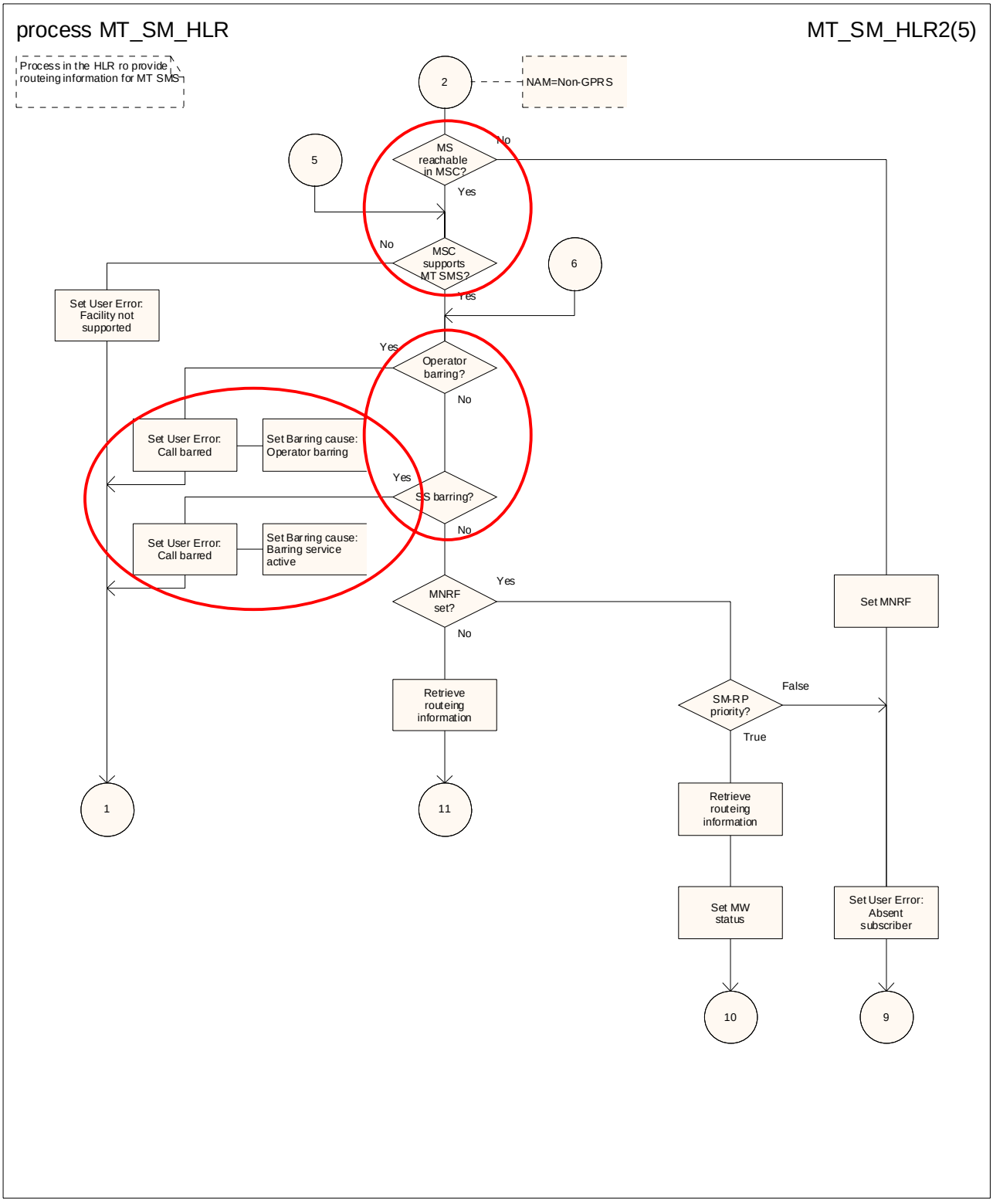


Figure 23.3/56 (sheet 2 of 5): Process MTobile_terminated_SM_HLR

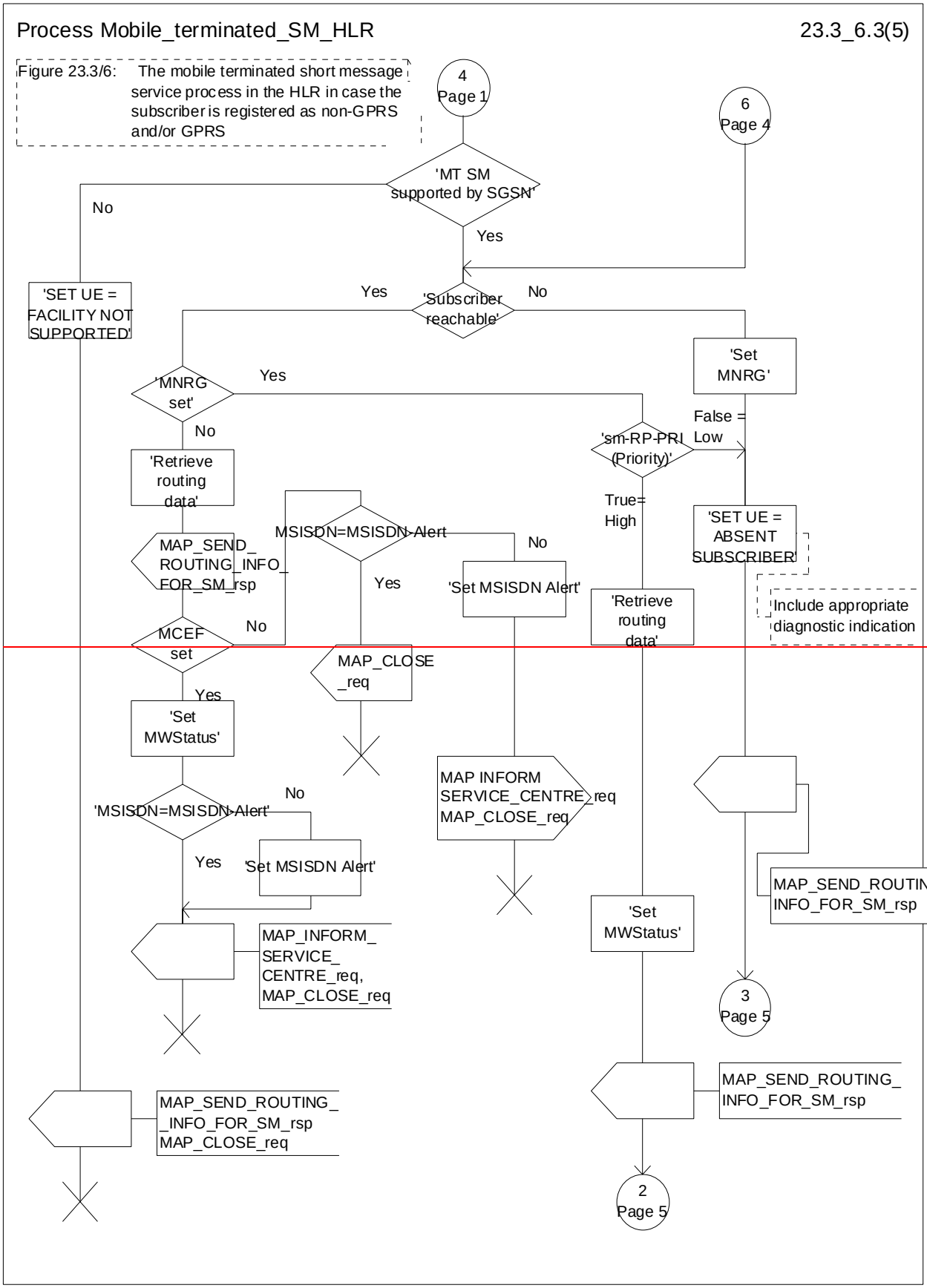


Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

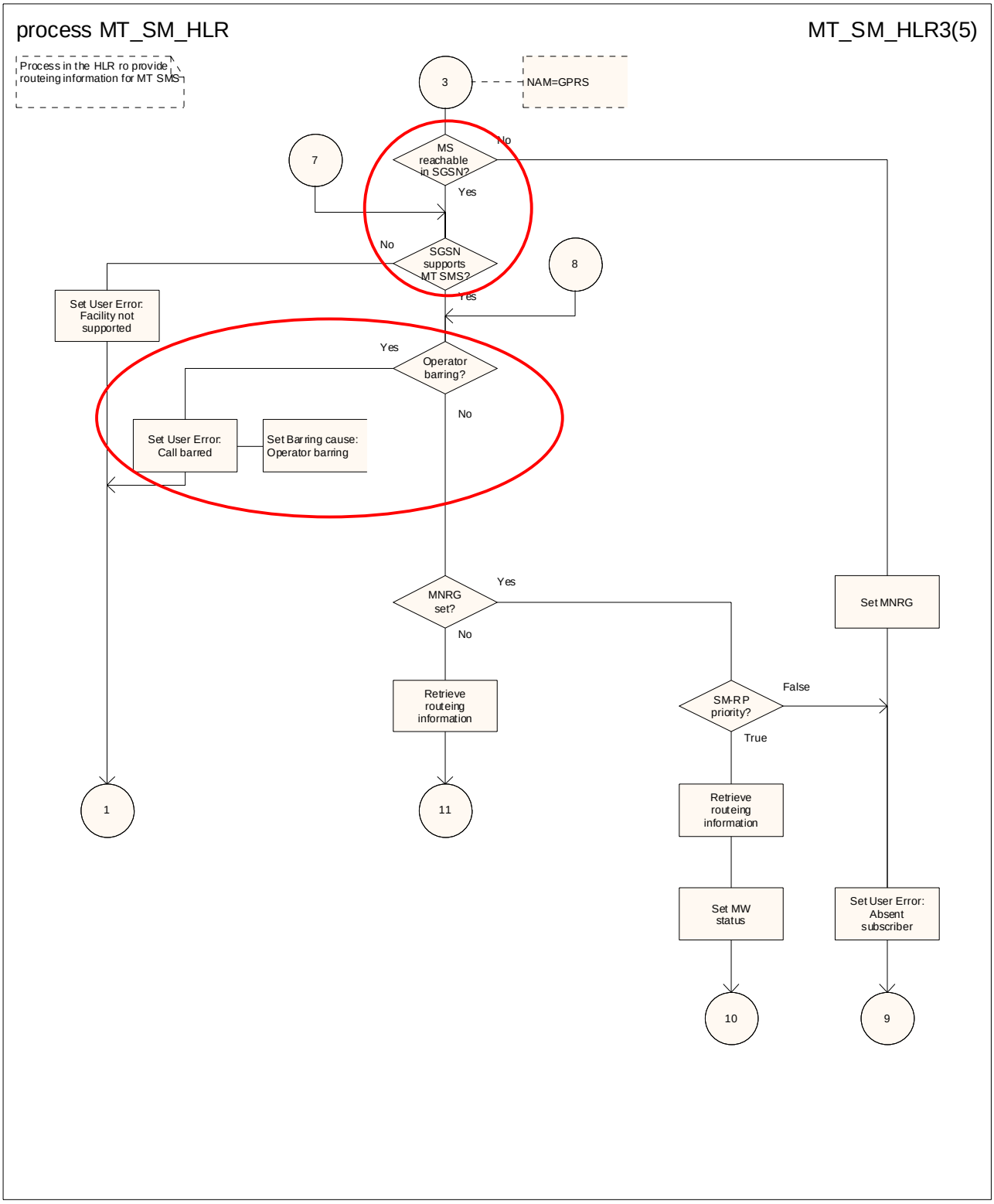


Figure 23.3/56 (sheet 3 of 5): Process MTobile_terminated _SM_HLR

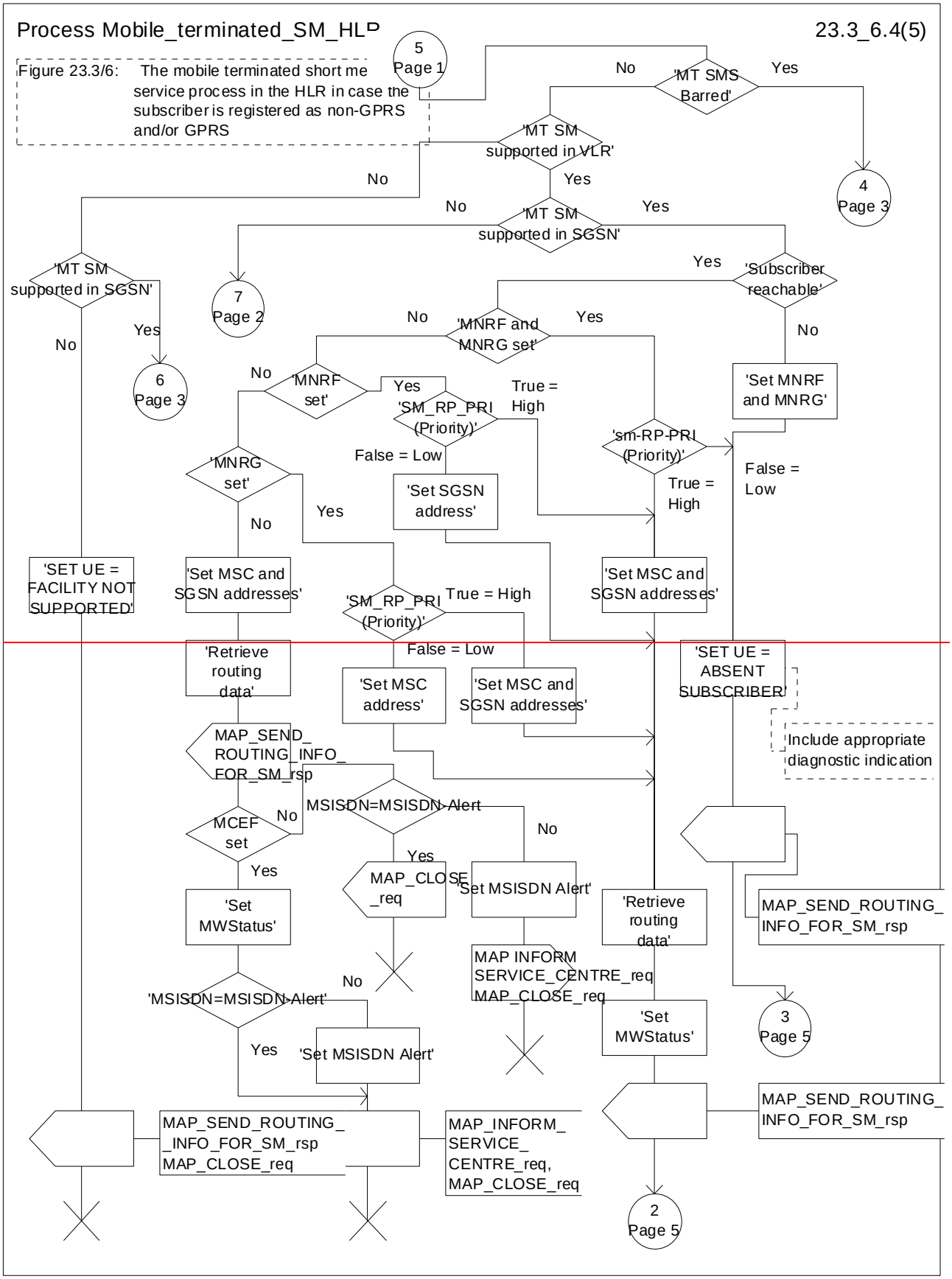


Figure 23.3/6: The mobile terminated short me service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

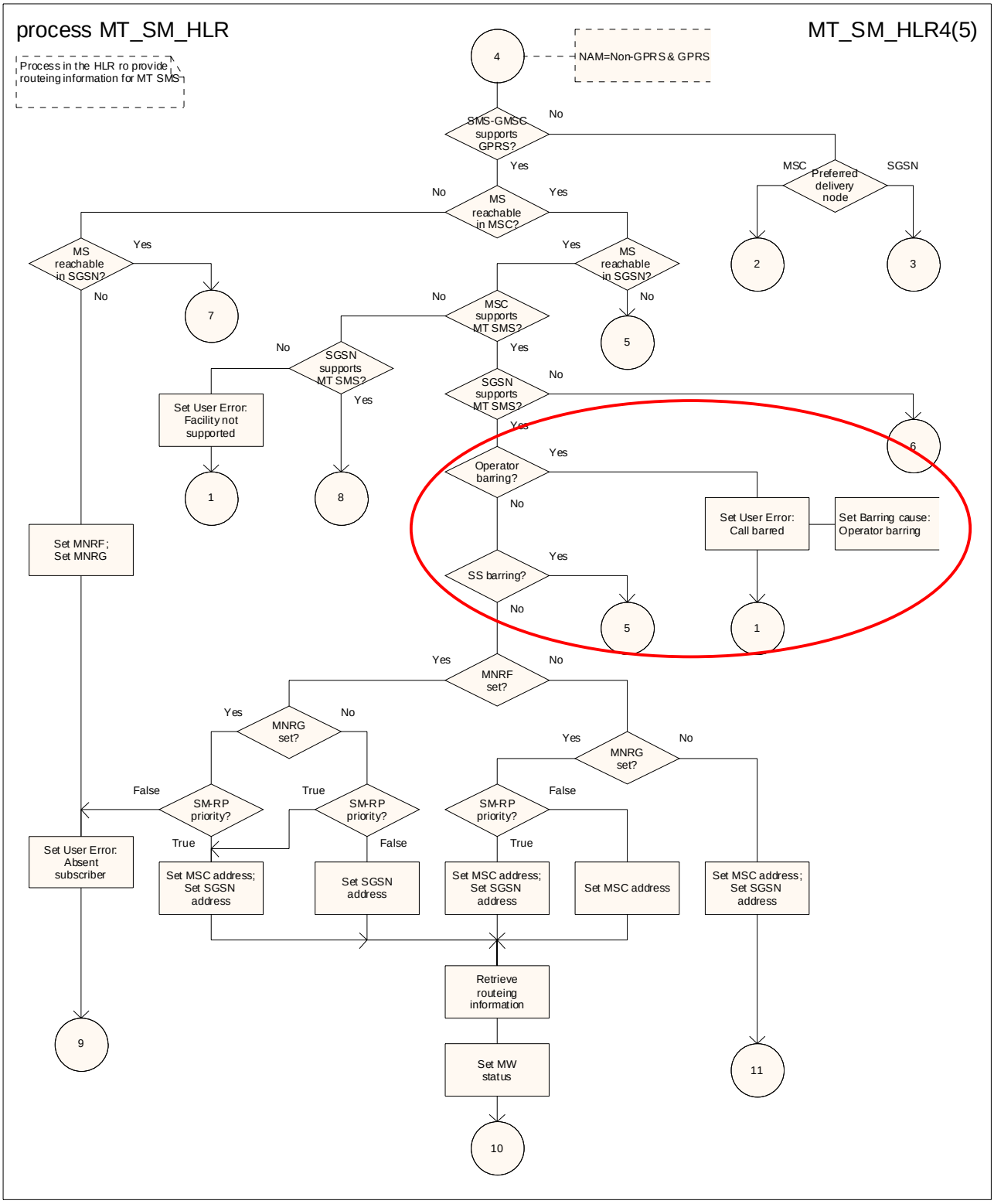
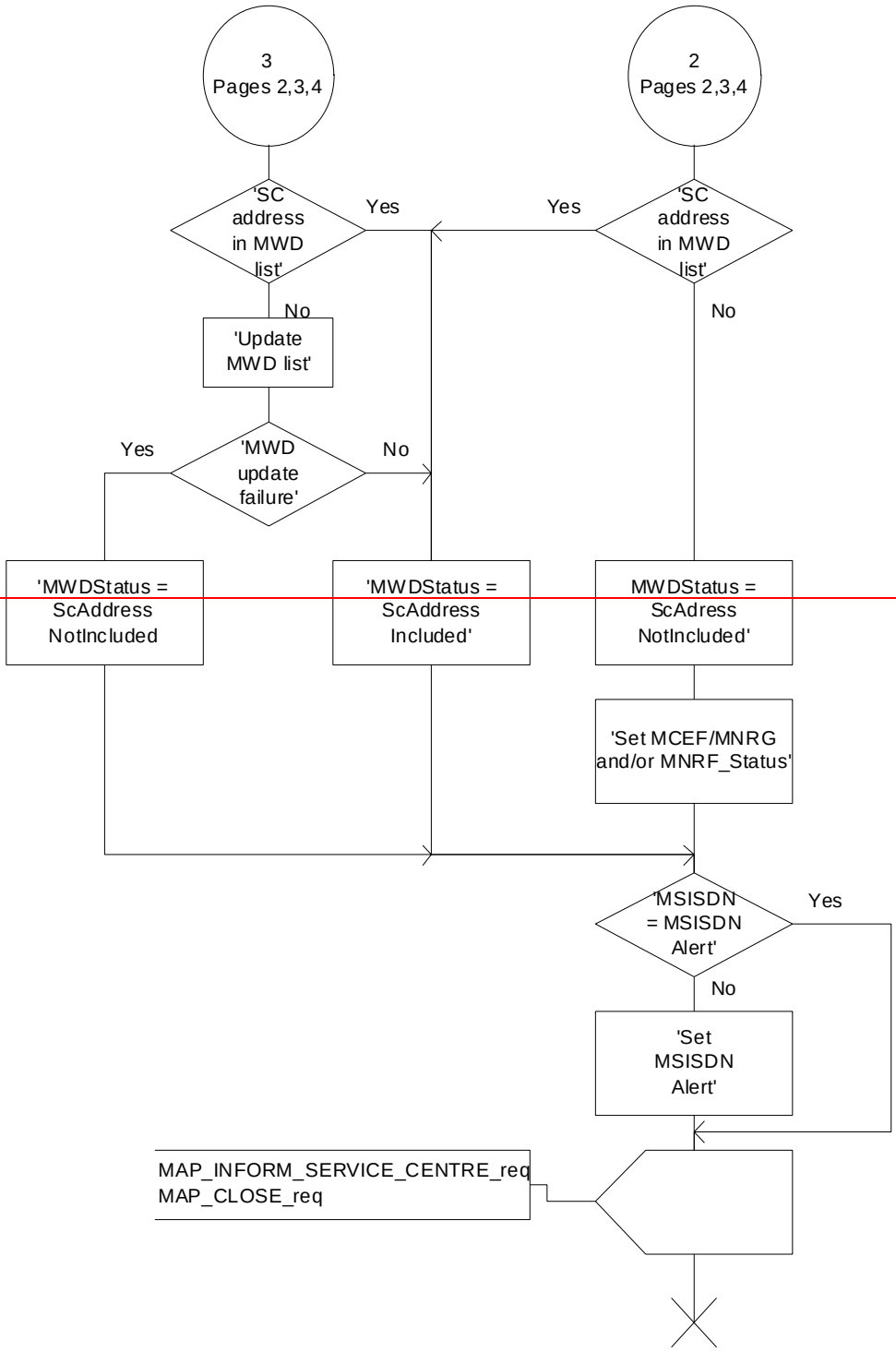


Figure 23.3/5~~6~~ (sheet 4 of 5): Process MT~~obile_terminated~~_SM_HLR

Process Mobile_terminated_SM_HLR 23.3_6.5(5)

Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS



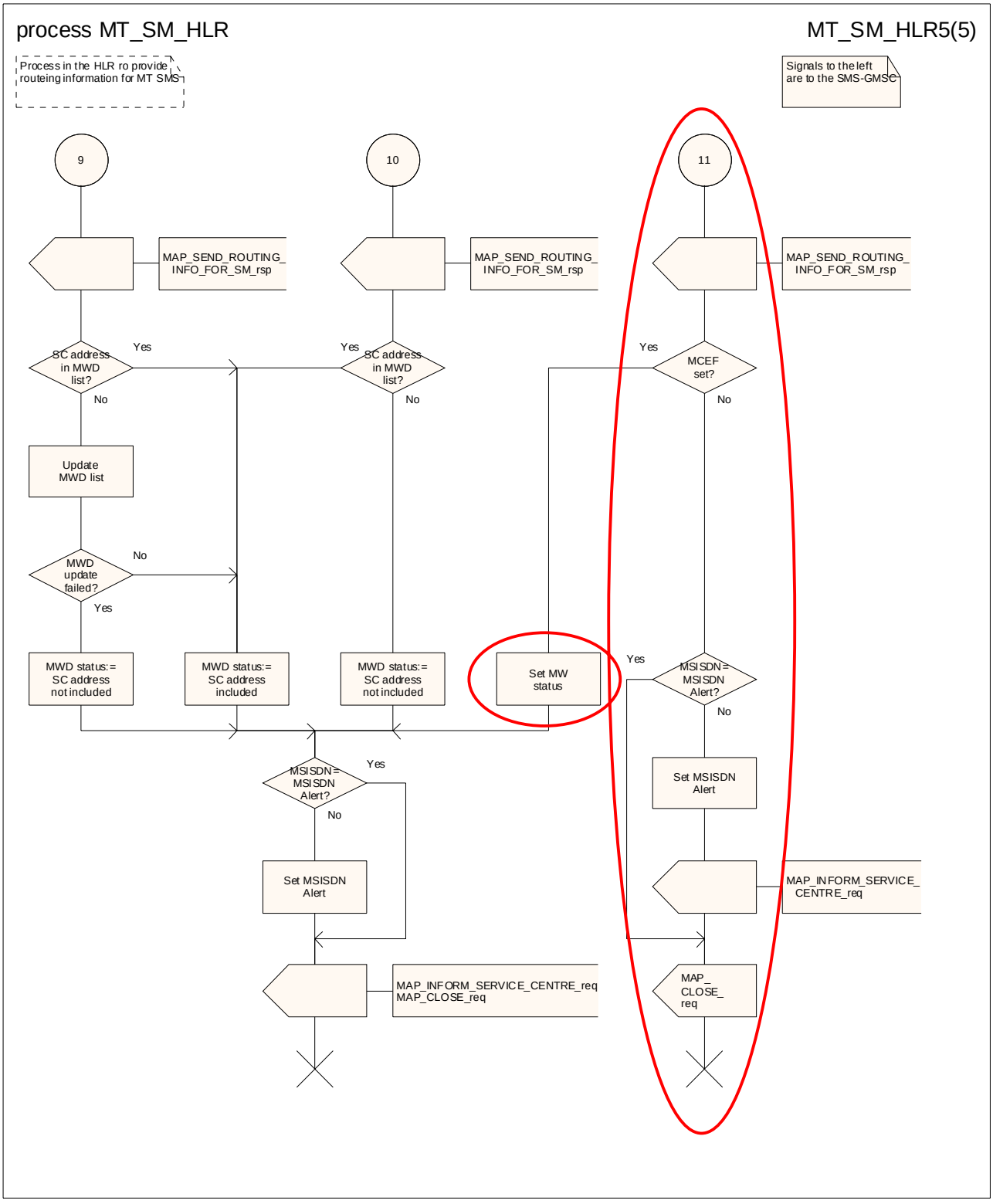
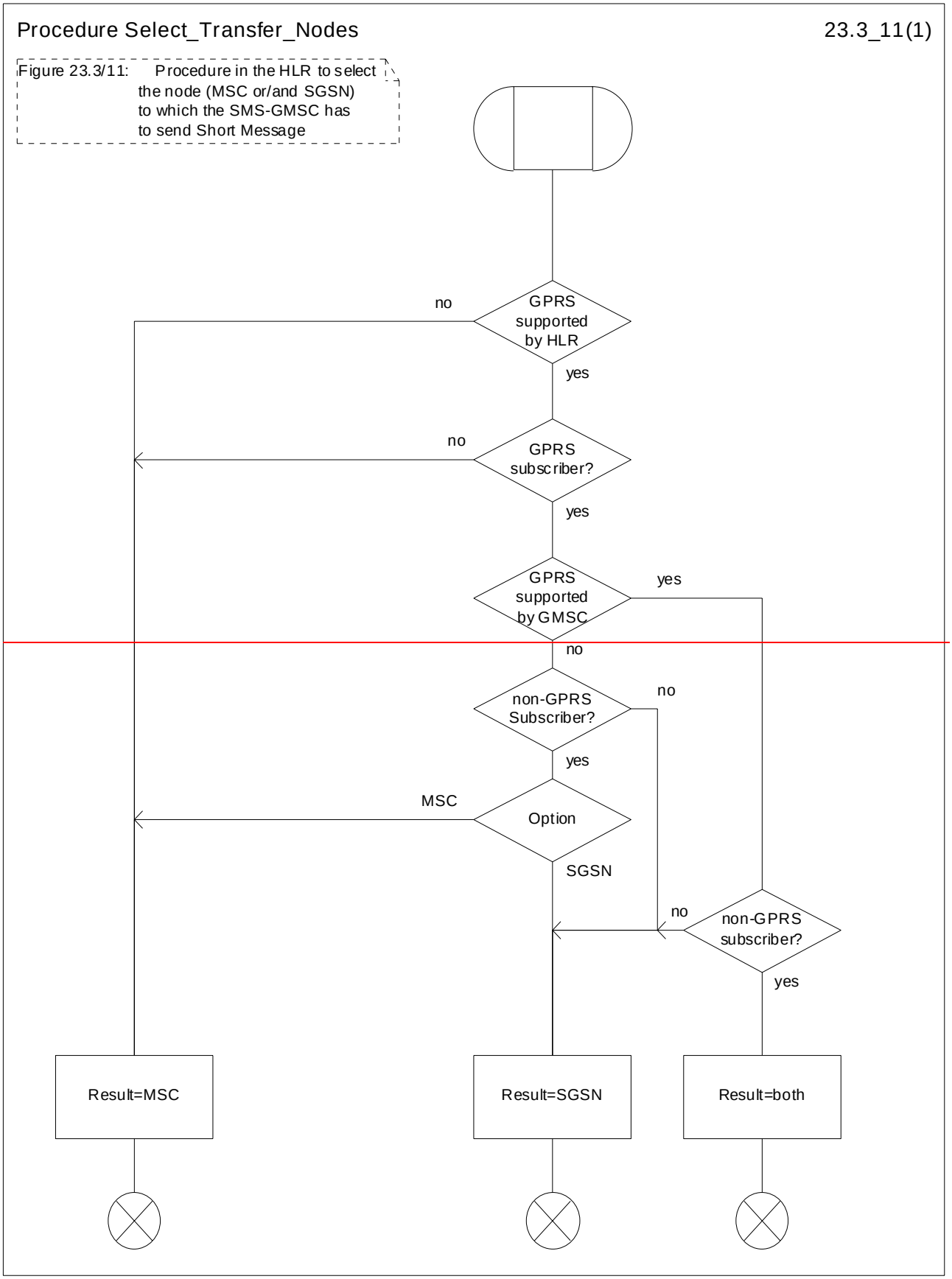


Figure 23.3/56 (sheet 5 of 5): Process MTobile_terminated_SM_HLR



~~**Figure 23.3/11: Procedure Select_Transfer_Nodes**~~

23.3.31 Procedure in the Serving MSC

Any CAMEL-specific handling defined in this subclause is omitted if the MSC does not support CAMEL control of MT SMS, or if the subscriber does not have a subscription for CAMEL control of MT SMS.

The process is triggered by a dialogue opening request with the application context shortMsgMT-RelayContext.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the MSC checks whether the dialogue opening request included a destination reference. If a destination reference was included, the MSC stores it and waits for a service primitive.
  - if the dialogue with the SMS-GMSC fails, the process returns to the Null state;
  - if the next primitive received is a MAP_DELIMITER indication, the MSC returns a MAP_DELIMITER request, and waits for a service primitive;
  - if the next primitive received is a MAP_MT_FORWARD_SHORT_MESSAGE indication, the MSC checks the indication.
    - if the indication is badly formed, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
    - if the indication is OK, the MSC invokes the macro MT_SM_Transfer_MSC to transfer the short message to the MS.
      - if the macro takes the "Release SMS" exit, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
      - if the macro takes the "Error" exit, the MSC reports the delivery failure to the gsmSCF (if CAMEL handling was invoked) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
      - if the macro takes the "Abort" exit, the MSC reports the delivery failure to the gsmSCF (if CAMEL handling was invoked), and the process returns to the Null state;
      - if the macro takes the "OK" exit, the MSC reports the successful delivery to the gsmSCF (if CAMEL handling was invoked) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".
        - if there are no more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;
        - if there are more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.
- When the MSC is waiting for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC:
  - if the dialogue with the SMS-GMSC fails, the MSC sends an Abort request to the MS, and the process returns to the Null state;
  - if it receives a Release indication over the A-interface, the MSC aborts the dialogue with the SMS-GMSC, and the process returns to the Null state;
  - if it receives a MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC, it checks the indication.

- if the indication is badly formed, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
- if the indication is OK, the MSC checks whether CAMEL handling is required.
  - if CAMEL handling is required, the MSC calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.
    - if the result is Release_SMS, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error defined by the gsmSCF, and the process returns to the Null state;
    - if the result is Continue, the MSC forwards the short message to the MS over the A interface, as described below.
  - if CAMEL handling is not required, the MSC forwards the short message to the MS over the A interface, as described below;
- the MSC sends an A_RP_MT_DATA request to the MS, and waits for the response from the MS.

- When the MSC is waiting for the response from the MS for delivery of a subsequent short message:
  - if the dialogue with the SMS-GMSC fails, the MSC sends an Abort request to the MS and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the MSC receives a Release indication over the A-interface, the MSC aborts the dialogue with the SMS-GMSC and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the MSC receives an error response from the MS, it maps the error to a MAP user error, reports the delivery failure to the gsmSCF (if CAMEL handling is required) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error, and the process returns to the Null state;
  - if the MSC receives a positive acknowledgement from the MS, it reports the successful delivery to the gsmSCF (if CAMEL handling is required) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".
    - if there are no more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;
    - if there are more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.

~~When initiating the dialogue with the serving MSC, the SMS-G MSC must provide the IMSI of the subscriber to whom the short message is directed.~~

~~The IMSI can be included either in the Destination Reference of the MAP_OPEN indication received from the SMS-G MSC or in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication.~~

~~When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service user in the serving MSC issues a MAP_DELIMITER request primitive in order to trigger the local MAP service provider to confirm the dialogue.~~

~~When receiving the first MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC, the serving MSC sends the MAP_SEND_INFO_FOR_MT_SMS request primitive to the VLR, if the MAP service primitive is accepted and if short message service is supported in the serving MSC.~~

~~The MAP_MT_FORWARD_SHORT_MESSAGE indication primitive is checked by the macro "Check_Indication". If the received MAP service primitive contains errors, the service is aborted and an unexpected data value error or data missing error is returned to the GMSC.~~

~~If the MSC does not support the short message service, the service is aborted in the serving MSC and the error "Facility Not Supported" is returned to the GMSC.~~

~~The subscriber identity information that may be included in the MAP_OPEN indication primitive and in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS" as follows.~~

~~If a Destination Reference has been received in the MAP_OPEN indication, an LMSI must be present in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication. The LMSI shall be included in the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS request sent to the VLR; the associated MAP_OPEN request must contain a Destination Reference that carries an IMSI.~~

~~Otherwise, if the IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication, it is mapped into the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS request that is sent to the VLR. In this case, the IMSI is not accompanied by an LMSI and neither the MAP_OPEN indication received from the SMS-GMSC nor the MAP_OPEN request sent to the VLR shall include a Destination Reference.~~

~~If a Destination Reference has been received in the serving MSC and the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication does not include an LMSI or if no Destination Reference has been received and the sm-RP-DA information field does not cover an IMSI the service is aborted in the serving MSC and the error "Unexpected Data Value" is returned to the SMS-GMSC.~~

~~The following responses to the MAP_SEND_INFO_FOR_MT_SMS request may be received from the VLR:~~

- ~~unidentified subscriber or system failure error. The error code is forwarded to the GMSC;~~
- ~~absent subscriber error. The absent subscriber_SM error is forwarded to the GMSC with the absent subscriber diagnostic indication set to 'IMSI Detached';~~
- ~~unknown subscriber error. The system failure indication is provided to the GMSC;~~
- ~~data missing or unexpected data value error. The system failure indication is provided to the GMSC;~~
- ~~a provider error or an abort indication. The system failure indication is provided to the GMSC;~~
- ~~subscriber busy for MT SMS. The error code is forwarded to the GMSC;~~
- ~~paging procedure invocation (see clause 25.3) reporting the successful outcome of the procedure;~~
- ~~search procedure invocation (see clause 25.3) reporting the successful outcome of the procedure.~~

~~The result of the paging or the search procedure is processed as follows:~~

- ~~if the procedure is completed successfully, the MSC will send the MAP_PROCESS_ACCESS_REQUEST request to the VLR (see clause 25.4);~~
- ~~if the procedure is completed successfully, but the MS has no mobile terminated short message transfer capability, the procedure is terminated and SM delivery failure indication with cause "equipment not SM equipped" is provided to the GMSC;~~
- ~~if the procedure ends unsuccessfully, the termination of the procedure is awaited from the VLR. The absent subscriber_SM error is forwarded to the GMSC with the absent subscriber diagnostic indication set to 'No Paging Response', but the other error causes are reported as a system failure indication.~~

~~If the short message transfer is aborted for any reason, the dialogue with the VLR is aborted. If the procedure with the VLR is aborted by the VLR or by the provider, a system failure indication is provided to the GMSC.~~

~~The unsuccessful outcome of the MAP_PROCESS_ACCESS_REQUEST service is reported by using the system failure error to the GMSC.~~

~~When the service MAP_PROCESS_ACCESS_REQUEST is carried out, the MSC will receive the MAP_SEND_INFO_FOR_MT_SMS confirmation indicating:~~

- ~~the unsuccessful outcome of the procedure. The error indication received from the VLR is forwarded to the GMSC;~~

- the successful outcome of the procedure. The MSC initiates forwarding of the short message to the MS.

The MSC may receive MAP_CONTINUE_CAMEL_SMS_HANDLING. The MSC then opens a CAMEL dialogue with the gsmSCF, as specified in 3GPP TS 23.078. If the CAMEL service bars the MT SM, then the failure is reported to the SMS-GMSC, and the MT SM is not delivered to the MS. Otherwise, the MSC shall send a second MAP_SEND_INFO_FOR_MT_SMS request to the VLR.

If the primitive itself is badly formatted or data is missing, the system failure error is sent to the GMSC.

If forwarding of the short message is initiated, the MSC awaits the result before one of the following responses is sent back to the GMSC:

- an acknowledgement if the short message has been successfully delivered to the mobile subscriber. The successful MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;

- an SM delivery failure error containing a parameter indicating either of the following: there is a MS protocol error or the MS memory capacity is exceeded; detailed diagnostic information (see clause 7.6.1.4) may also be carried. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;

- a system failure error if the delivery procedure is aborted. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078.

If the More Messages To Send flag was FALSE or the service MAP_MT_FORWARD_SHORT_MESSAGE ends unsuccessfully, the transaction to the SMS-GMSC is terminated. If the More Messages To Send flag was TRUE, then the servicing MSC waits for the next short message from the Service Centre.

When receiving the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC the serving MSC will act as follows:

- if the received primitive contains errors, then the unexpected data value error or data missing error is provided to the SMS-GMSC;

- The MSC opens a CAMEL dialogue as specified in 3GPP TS 23.078 for each SM. If the CAMEL service bars the MT SM, then the failure is reported to the GMSC, and the MT SM is not delivered to the MS.

- if the More Messages To Send flag is FALSE, then the serving MSC will start the short message transfer procedure to the mobile subscriber. The successful or unsuccessful outcome of this procedure is reported to the gsmSCF as specified in 3GPP TS 23.078 and to the SMS-GMSC and the transaction is terminated.

- if the More Messages To Send flag is TRUE, then the serving MSC will start the short message transfer to the mobile subscriber. If the outcome of this procedure is unsuccessful, then the SM delivery failure is reported to the gsmSCF and the the reason is reported to the SMS-GMSC and the procedure is terminated. If the procedure is successful, then the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078, and it is acknowledged to the SMS-GMSC and more short messages can be received.

The tracing procedure may be activated. It is described in detail in clause 25.

The mobile terminated short message transfer process~~dure~~ in the serving MSC is shown in figure~~s 23.3/3~~23.3/6. ~~and~~

The macro MT_SM_Transfer_MSC may be invoked either in a stand-alone serving MSC or in a serving MSC which is integrated with the SMS-GMSC. It is used to transfer the first MT short message of a possible sequence of messages.

If the MSC does not support MT SMS, it sets the User Error to "Facility not supported" and the macro takes the "Error" exit.

If the MSC supports MT SMS, it invokes the macro Check_Subscr_Identity_for_SMS. If the macro Check_Subscr_Identity_for_SMS takes the "Error" exit, the macro MT_SM_Transfer_MSC takes the "Error" exit.

If the macro Check_Subscr_Identity_for_SMS takes the the "OK" exit, the MSC sends a dialogue opening request, followed by a MAP_SEND_INFO_FOR_MT_SMS request, to the VLR and waits for a response.

If the dialogue opening fails, the macro takes the "Error" exit.

If the dialogue opening succeeds, the MSC sets the variable CAMEL Handling to False and waits for the response from the VLR.

When the MSC is waiting for the response from the VLR:

- if it receives a MAP_CONTINUE_CAMEL_SMS_HANDLING indication from the VLR, it sets the variable CAMEL Handling to True, calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.
  - if the result is Release_SMS, the MSC aborts the dialogue with the VLR, and the macro takes the "Release SMS" exit;
  - if the result is Continue, the MSC sends a second MAP_SEND_INFO_FOR_MT_SMS request, with the "Suppress MT-SMS-CSI parameter set, to the VLR, and waits for the response from the VLR.
- if it receives a MAP_SEND_INFO_FOR_MT_SMS confirmation, it sets the User Error parameter according to the User Error parameter received in the MAP_SEND_INFO_FOR_MT_SMS confirmation, and the macro takes the "Error" exit;
- if it receives a MAP_PAGE indication, it invokes the Page_MSC macro described in subclause 25.3.
  - if the Page_MSC macro takes the "Null" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;
  - if the Page_MSC macro takes the "Error" exit, the MSC waits for a further response from the VLR;
  - if the Page_MSC macro takes the "OK" exit, the MSC checks whether the MS supports SMS, as described below.
- if it receives a MAP_SEARCH_FOR_MS indication, it invokes the Search_For_MS_MSC macro described in subclause 25.3.
  - if the Search_For_MS_MSC macro takes the "Null" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;
  - if the Search_For_MS_MSC macro takes the "Error" exit, the MSC waits for a further response from the VLR;
  - if the Search_For_MS_MSC macro takes the "OK" exit, the MSC checks whether the MS supports SMS, as described below.
- if the MS does not support SMS, the MSC sets the User Error to "SM Delivery Failure" with delivery failure cause "Equipment not SM equipped", aborts the dialogue with the VLR and aborts the connection to the MS, and the macro takes the "Error" exit;
- if the MS supports SMS, the MSC invokes the macro Process_Access_Request_MSC described in subsclause 25.4.
  - if the Process_Access_Request_MSC macro takes the "Error" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;
  - if the Process_Access_Request_MSC macro takes the "OK" exit, the MSC waits for a further response from the VLR.

When the MSC is waiting for a further response from the VLR:

- if it receives a MAP_TRACE_SUBSCRIBER_ACTIVITY indication from the VLR, it performs tracing activity as described in subclause 25.9, and waits for a further response from the VLR;
- if it receives a MAP_SEND_INFO_FOR_MT_SMS confirmation, it checks the confirmation.
  - if the confirmation contains a User Error, the MSC sets the User Error according to the User Error received in the confirmation, and the macro takes the "Error" exit;
  - if the confirmation contains a Provider Error or a Data Error, the MSC sets the User Error to "System failure", and the macro takes the "Error" exit;
  - if the confirmation indicates success, the MSC forwards the short message to the MS, and waits for a response from the MS.

- if the MS returns an error, the MSC sets the User Error according to the response from the MS, and the macro takes the "Error" exit;

- if the MS returns a positive~~a~~ acknowledgement, the macro takes the "OK" exit.

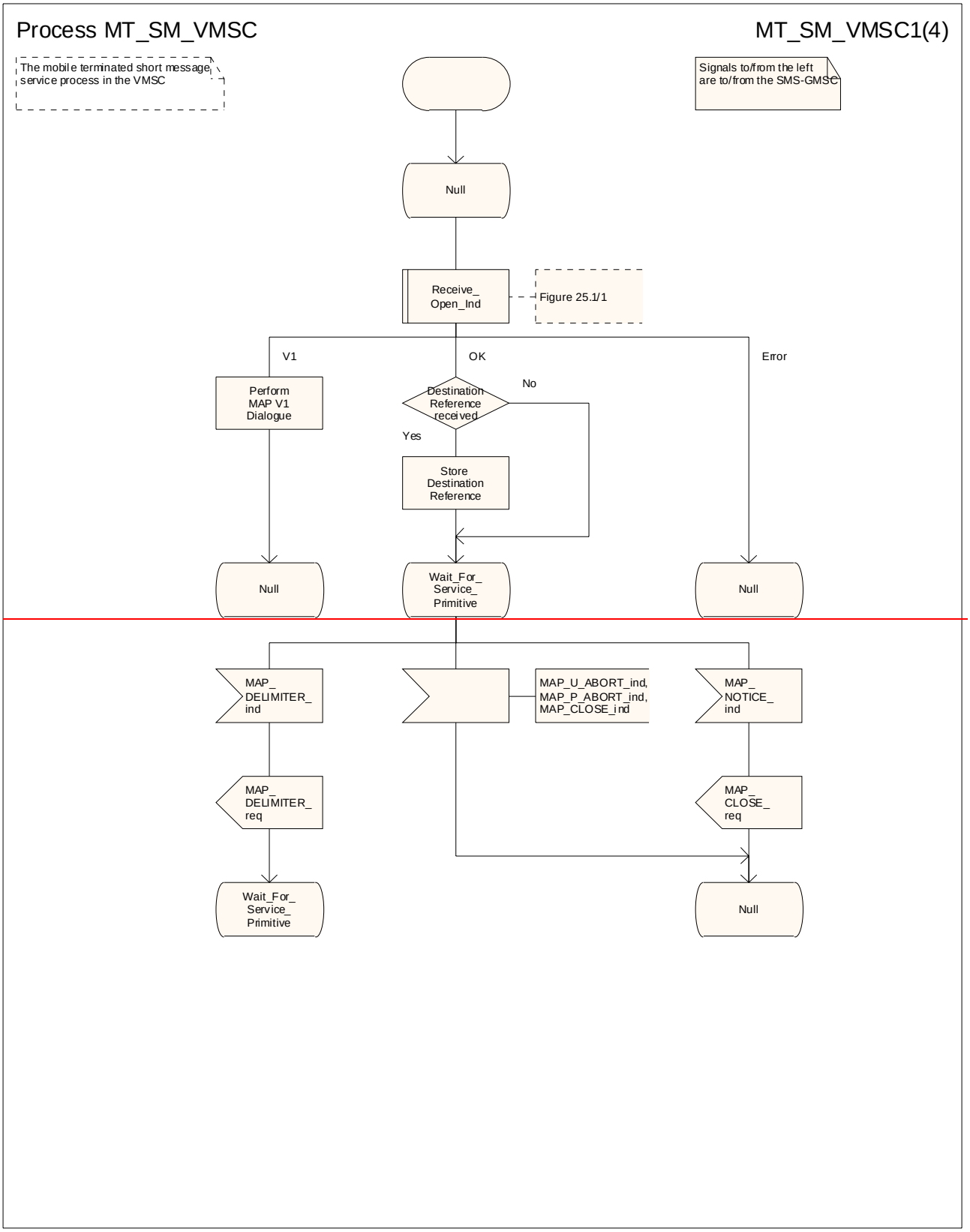
When the MSC is waiting for a response from the VLR for the MAP_SEND_INFO_FOR_MT_SMS request, or a response from the VLR for the MAP_PROCESS_ACCESS_REQUEST request, or the response from the MS for the first short message:

- if the MSC receives a Release on the A-interface, it aborts the dialogue with the VLR (if the dialogue is still open) and sets the User Error to "System failure", and the macro takes the "Error" exit;

- if the dialogue with the VLR fails, the MSC aborts the connection to the MS and sets the User Error to "System failure", and the macro takes the "Error" exit;

- if the dislogue with the SMS-GMSC fails, the the MSC aborts the dialogue with the VLR (if the dialogue is still open) and aborts the connection to the MS, and the macro takes the "Abort" exit.

~~23.3/4~~The macro MT_SM_Transfer_MSC is shown in figure 23.3/7. The macro Check_Subscr_Identity_For_MT_SMS is shown in figure 23.3/8.~~The page and search procedures are shown in figures 25.3/1 and 25.3/2.~~


Process MT_SM_VMSC
MT_SM_VMSC1(4)
The mobile terminated short message service process in the VMSC
Signals to/from the left are to/from the SMS-GMSC
Null
Receive_ Open_Ind
Figure 25.1/1
V1
OK
Error
Perform MAP V1 Dialogue
Destination Reference received
No
Yes
Store Destination Reference
Null
Wait_For_ Service_ Primitive
Null
MAP_ DELIMITER_ ind
MAP_U_ABORT_ind, MAP_P_ABORT_ind, MAP_CLOSE_ind
MAP_ NOTICE_ ind
MAP_ DELIMITER_ req
MAP_ CLOSE_ req
Wait_For_ Service_ Primitive
Null

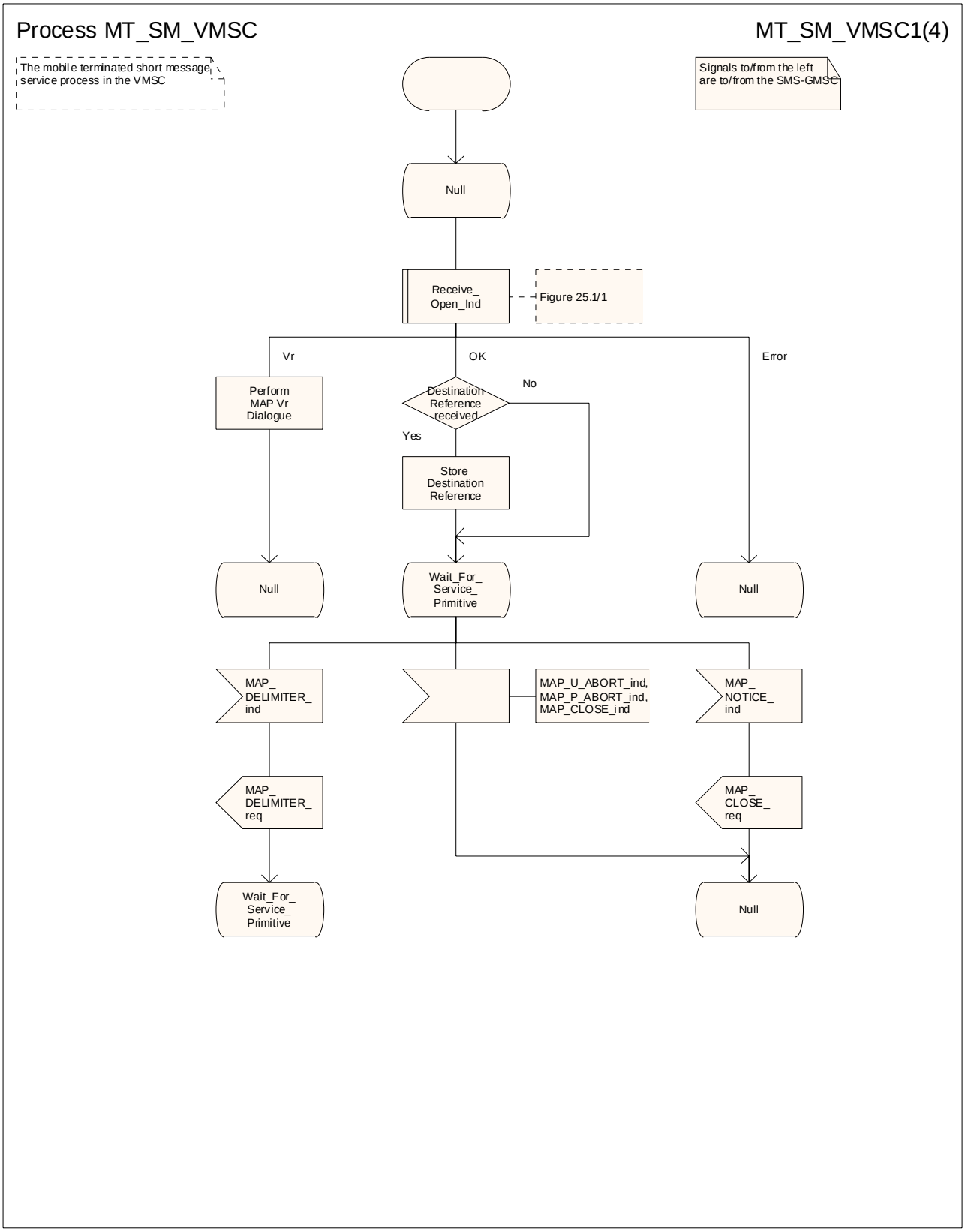
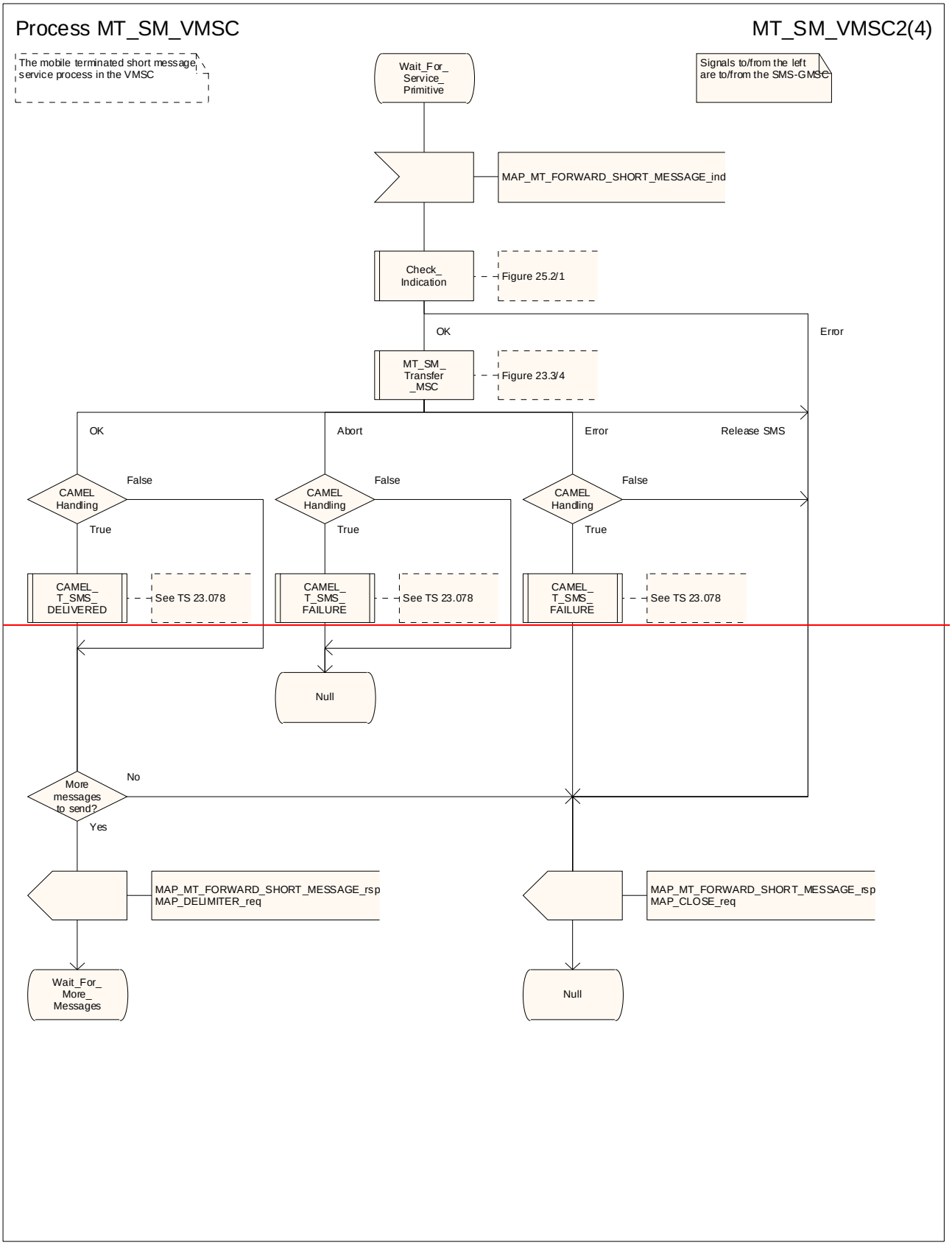
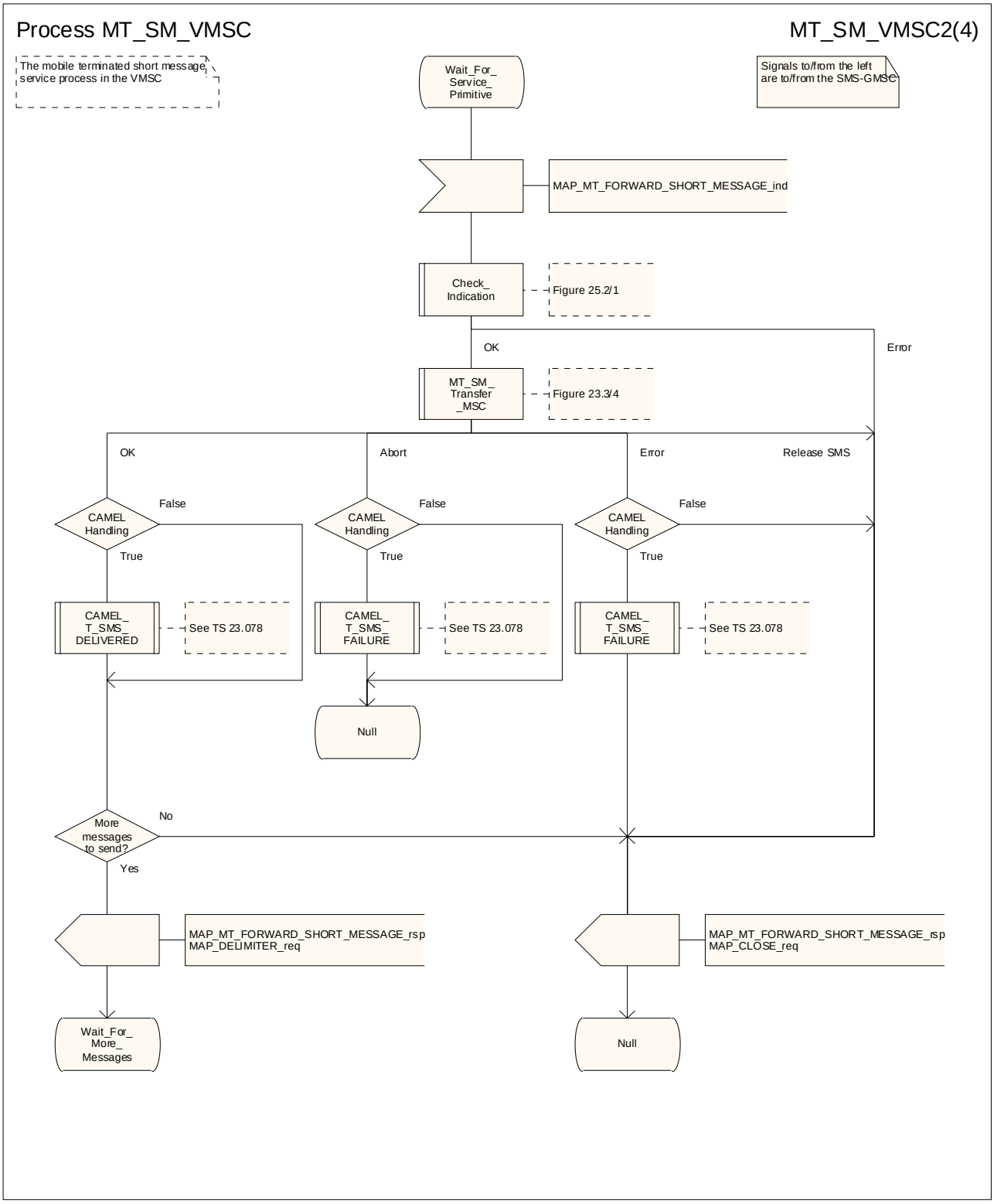


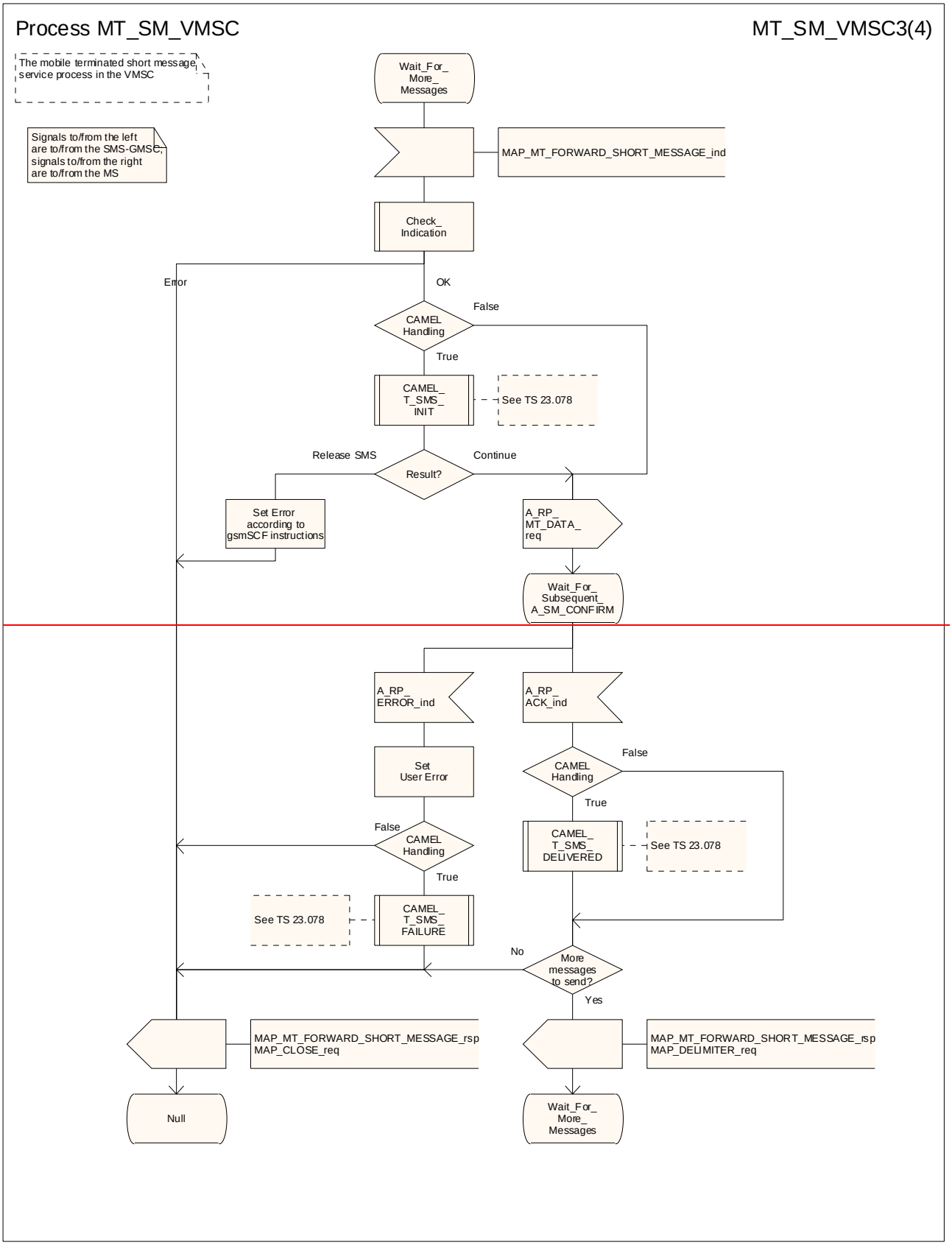
Figure ~~23.3/3~~23.3/6 (sheet 1 of 4): Procedure MT_SM_VMSC


Process MT_SM_VMSC
MT_SM_VMSC2(4)
The mobile terminated short message service process in the VMSC
Wait_For_ Service_ Primitive
Signals to/from the left are to/from the SMS-GMSC
MAP_MT_FORWARD_SHORT_MESSAGE_ind
Check_ Indication
Figure 25.2/1
OK
Error
MT_SM_ Transfer _MSC
Figure 23.3/4
OK
Abort
Error
Release SMS
CAMEL Handling
False
True
CAMEL_ T_SMS_ DELIVERED
See TS 23.078
CAMEL_ T_SMS_ FAILURE
Null
More messages to send?
No
Yes
MAP_MT_FORWARD_SHORT_MESSAGE_rsp
MAP_DELIMITER_req
MAP_CLOSE_req
Wait_For_ More_ Messages



CR editor's note: the only change to this sheet is the size of the frame!

Figure ~~23.3/3~~23.3/6 (sheet 2 of 4): Procedure MT_SM_VMSC


Process MT_SM_VMSC
MT_SM_VMSC3(4)
The mobile terminated short message service process in the VMSC
Signals to/from the left are to/from the SMS-GMSC, signals to/from the right are to/from the MS
Wait_For_ More_ Messages
MAP_MT_FORWARD_SHORT_MESSAGE_ind
Check_ Indication
Error
OK
CAMEL Handling
False
True
CAMEL_ T_SMS_ INIT
See TS 23.078
Release SMS
Result?
Continue
Set Error according to gsmSCF instructions
A_RP_ MT_DATA_ req
Wait_For_ Subsequent_ A_SM_CONFIRM
A_RP_ ERROR_ind
A_RP_ ACK_ind
Set User Error
CAMEL Handling
False
True
CAMEL_ T_SMS_ DELIVERED
See TS 23.078
False
CAMEL Handling
True
See TS 23.078
CAMEL_ T_SMS_ FAILURE
No
More messages to send?
Yes
MAP_MT_FORWARD_SHORT_MESSAGE_rsp MAP_CLOSE_req
MAP_MT_FORWARD_SHORT_MESSAGE_rsp MAP_DELIMITER_req
Null
Wait_For_ More_ Messages

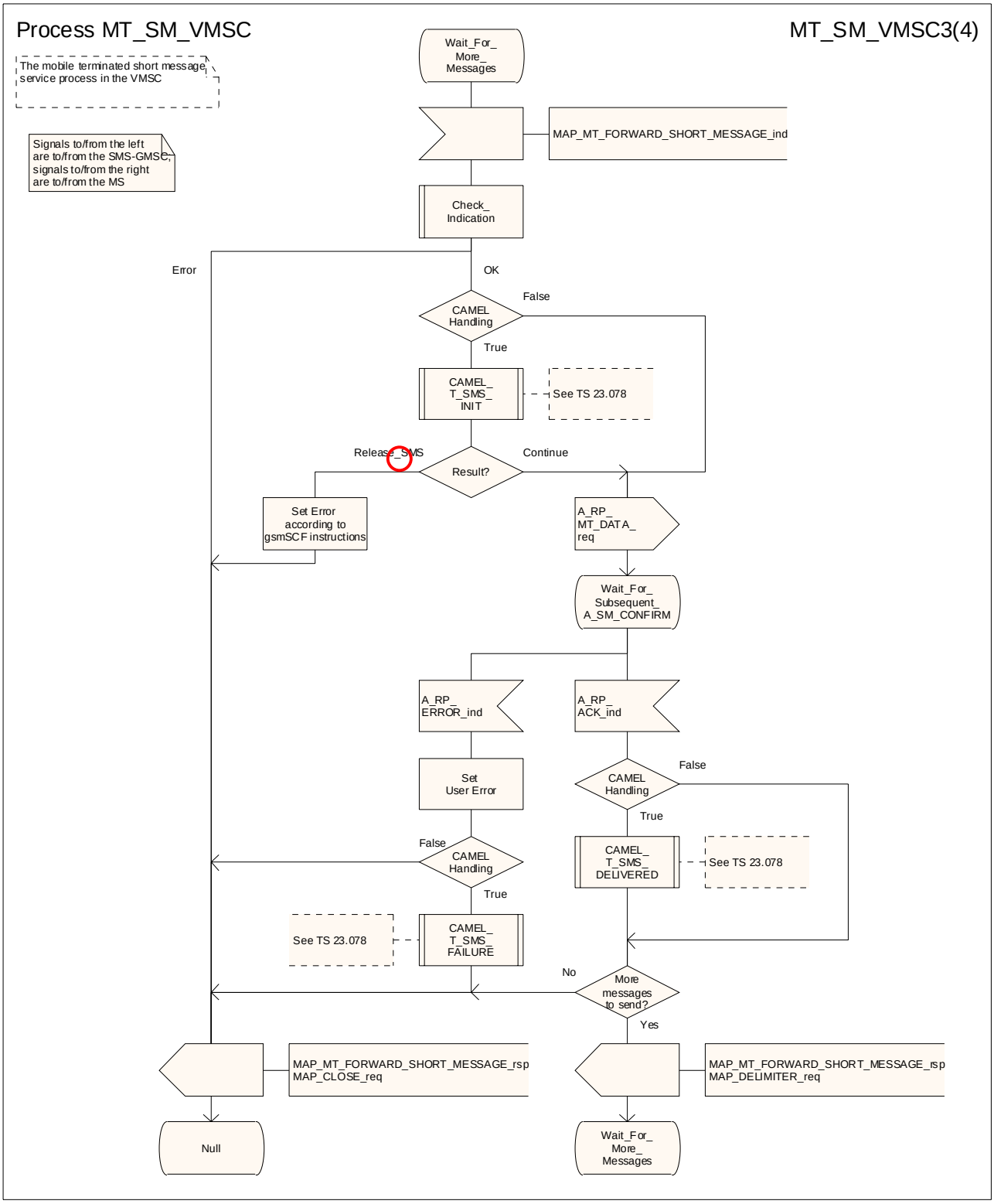


Figure ~~23.3/3~~23.3/6 (sheet 3 of 4): Procedure MT_SM_VMSC

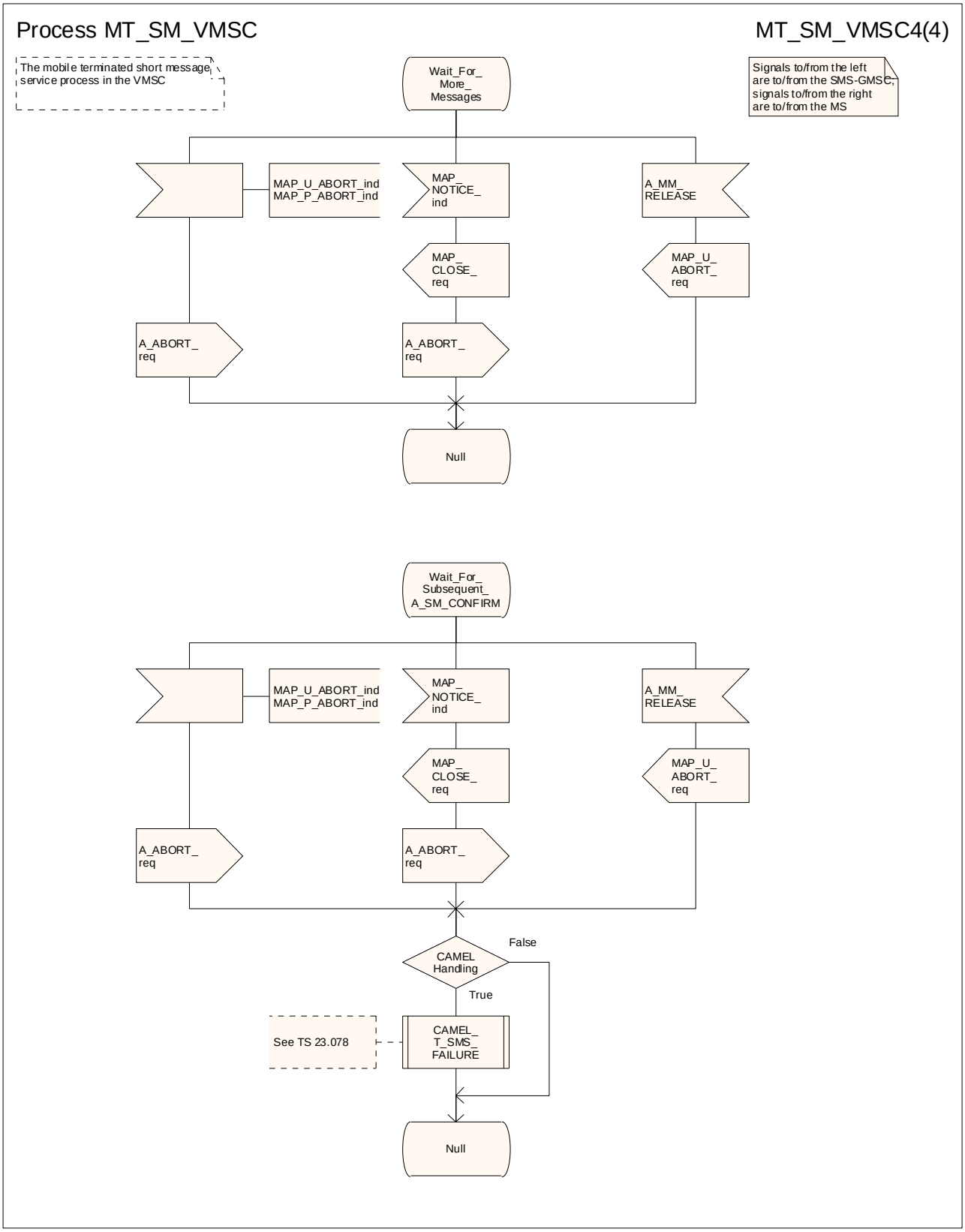
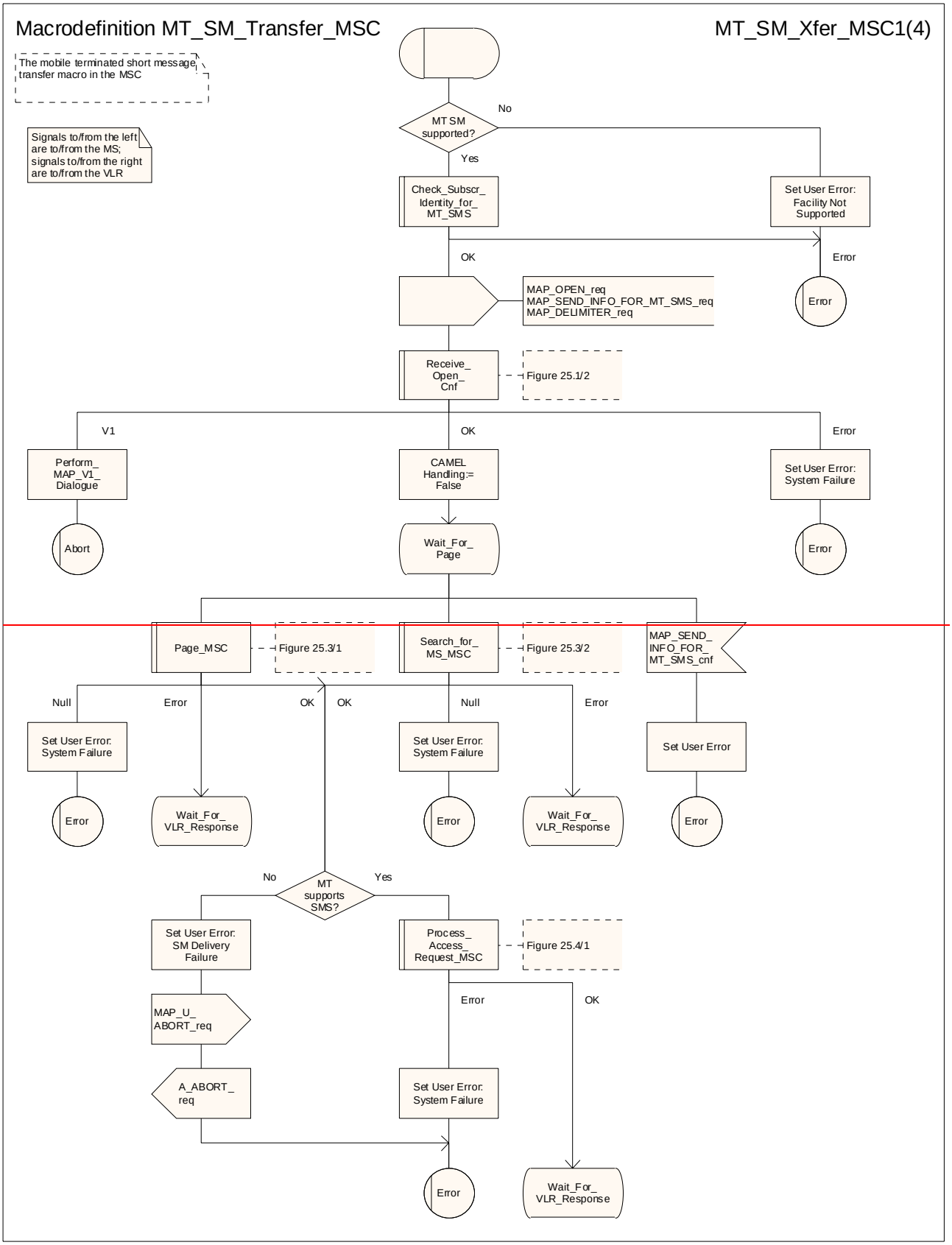


Figure ~~23.3/3~~23.3/6 (sheet 4 of 4): Procedure MT_SM_VMSC


Macrodefinition MT_SM_Transfer_MSC
MT_SM_Xfer_MSC1(4)
The mobile terminated short message transfer macro in the MSC
Signals to/from the left are to/from the MS; signals to/from the right are to/from the VLR
MT SM supported?
No
Yes
Check_Subscr_ Identity_for_ MT_SMS
Set User Error: Facility Not Supported
OK
Error
MAP_OPEN_req
MAP_SEND_INFO_FOR_MT_SMS_req
MAP_DELIMITER_req
Error
Receive_ Open_ Cnf
Figure 25.1/2
V1
OK
Error
Perform_ MAP_V1_ Dialogue
CAMEL Handling:= False
Set User Error: System Failure
Abort
Wait_For_ Page
Error
Page_MSC
Figure 25.3/1
Search_for_ MS_MSC
Figure 25.3/2
MAP_SEND_ INFO_FOR_ MT_SMS_cnf
Null
Error
OK
OK
Null
Error
Set User Error: System Failure
Set User Error: System Failure
Set User Error
Error
Wait_For_ VLR_Response
Error
Wait_For_ VLR_Response
Error
No
MT supports SMS?
Yes
Set User Error: SM Delivery Failure
Process_ Access_ Request_MSC
Figure 25.4/1
Error
OK
MAP_U_ ABORT_req
A_ABORT_ req
Set User Error: System Failure
Error
Wait_For_ VLR_Response

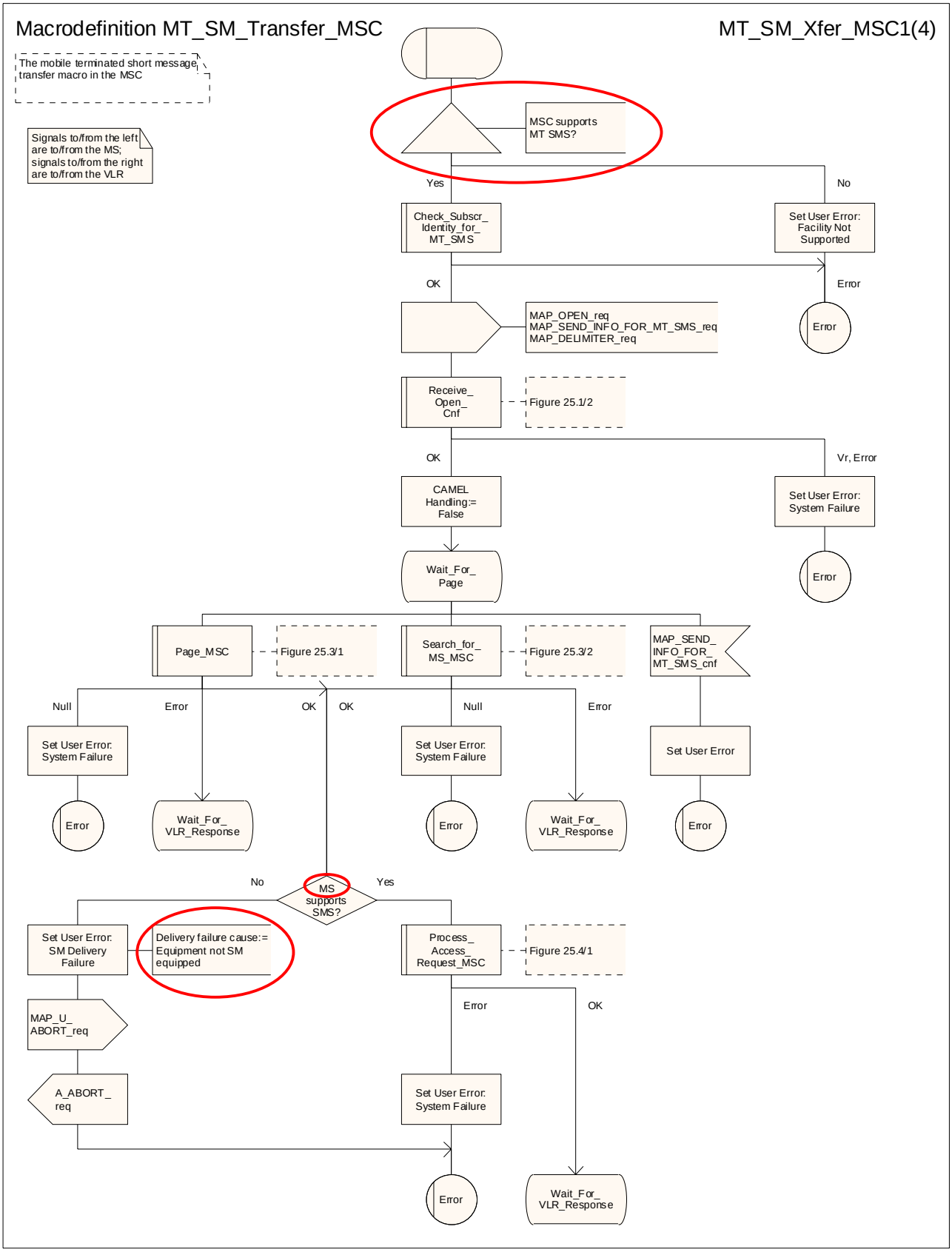
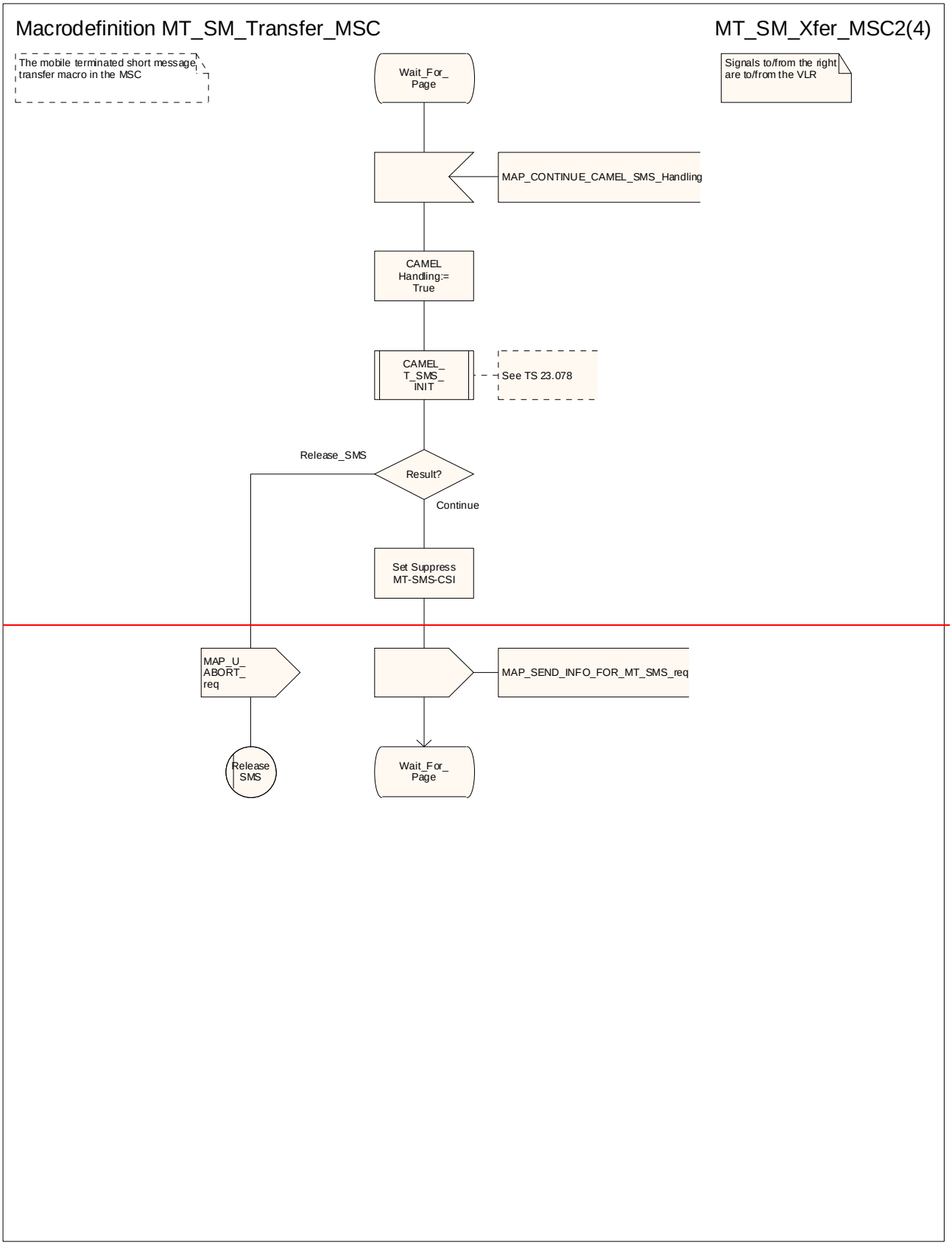


Figure ~~23.3/4~~23.3/7 (sheet 1 of 4): Macro MT_SM_Transfer_MSC


Macrodefinition MT_SM_Transfer_MSC
MT_SM_Xfer_MSC2(4)
The mobile terminated short message transfer macro in the MSC
Signals to/from the right are to/from the VLR
Wait_For_ Page
MAP_CONTINUE_CAMEL_SMS_Handling
CAMEL Handling:= True
CAMEL_ T_SMS_ INIT
See TS 23.078
Release_SMS
Result?
Continue
Set Suppress MT-SMS-CSI
MAP_U_ ABORT_ req
MAP_SEND_INFO_FOR_MT_SMS_req
Release SMS
Wait_For_ Page

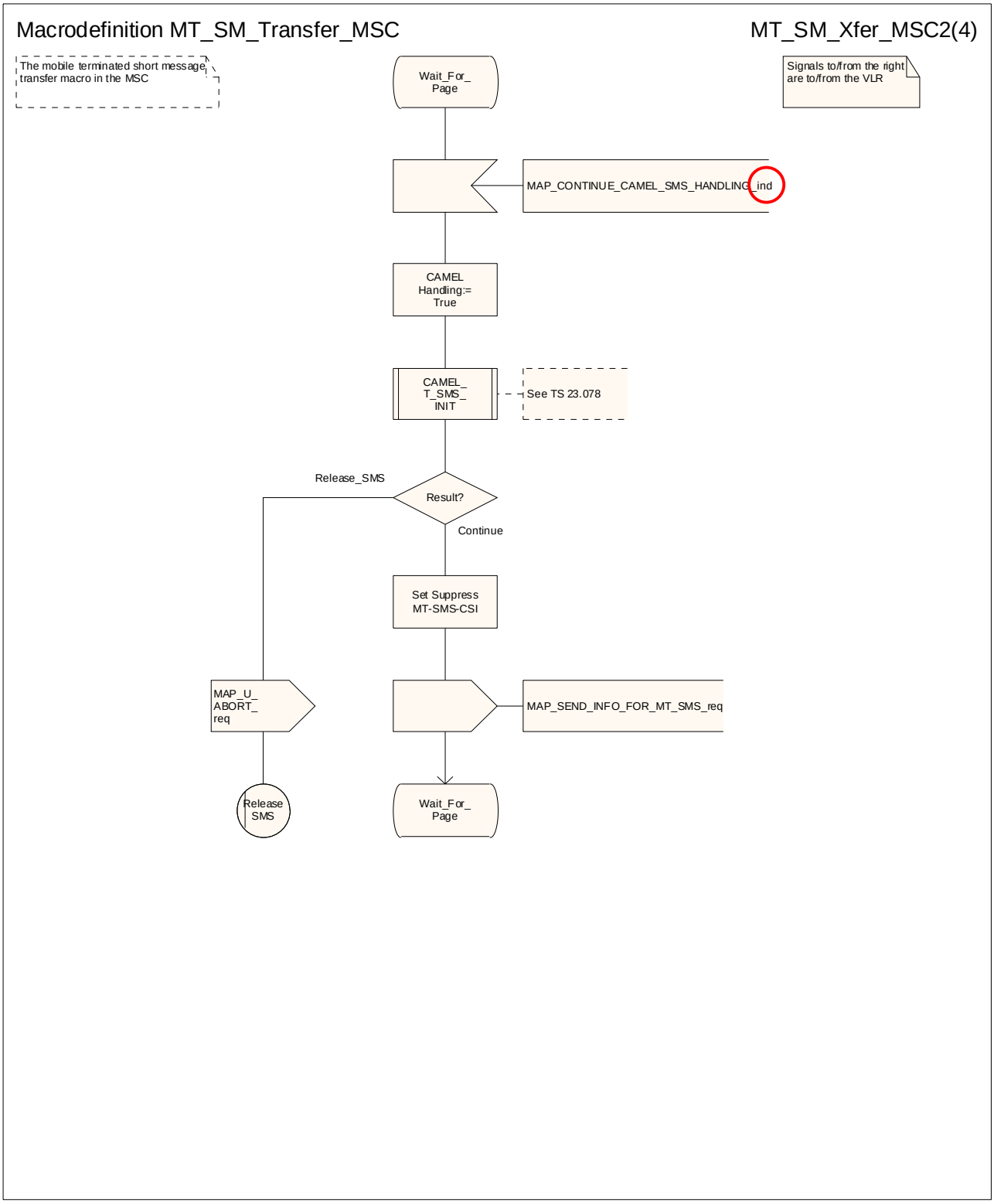


Figure ~~23.3/4~~23.3/7 (sheet 2 of 4): Macro MT_SM_Transfer_MSC

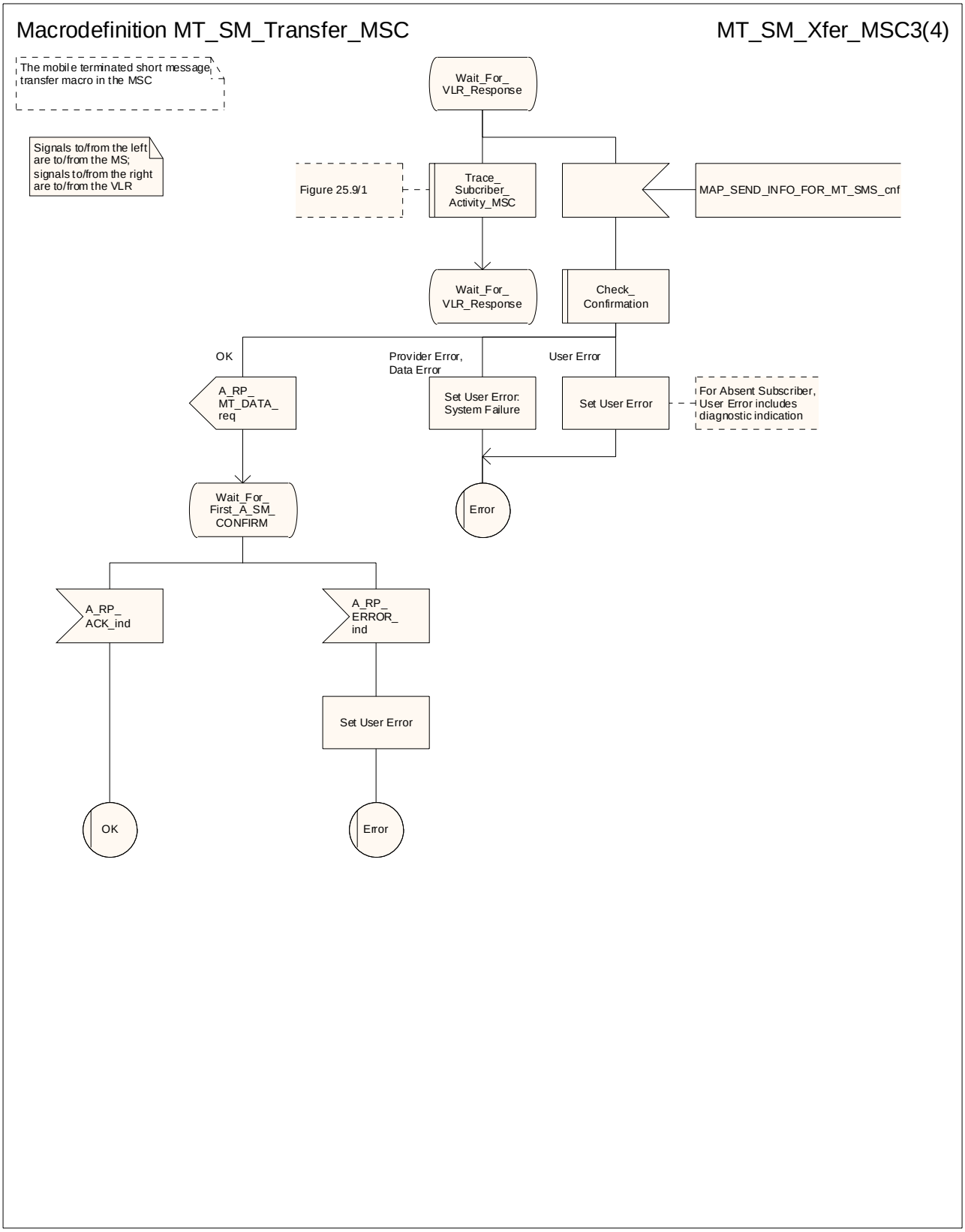
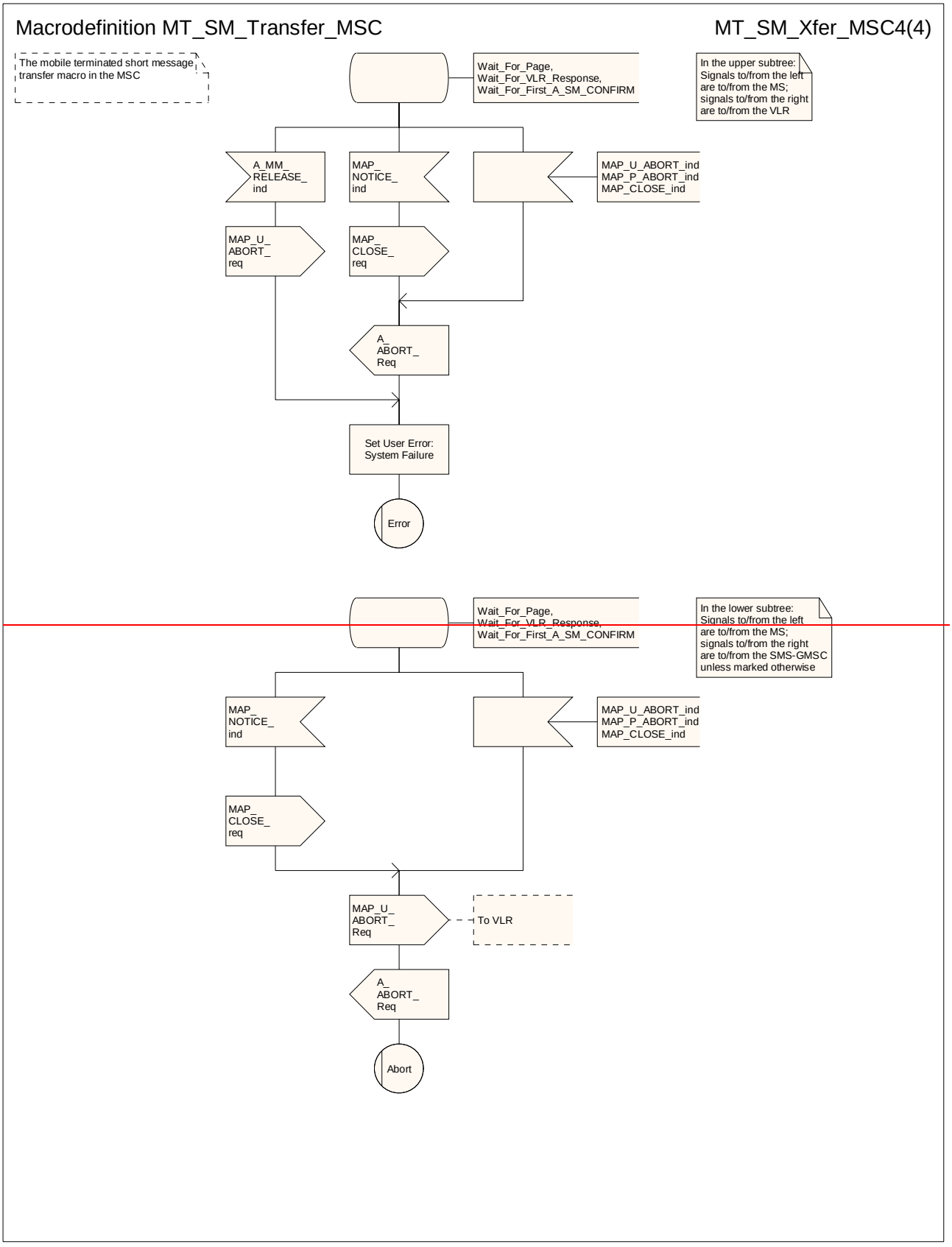
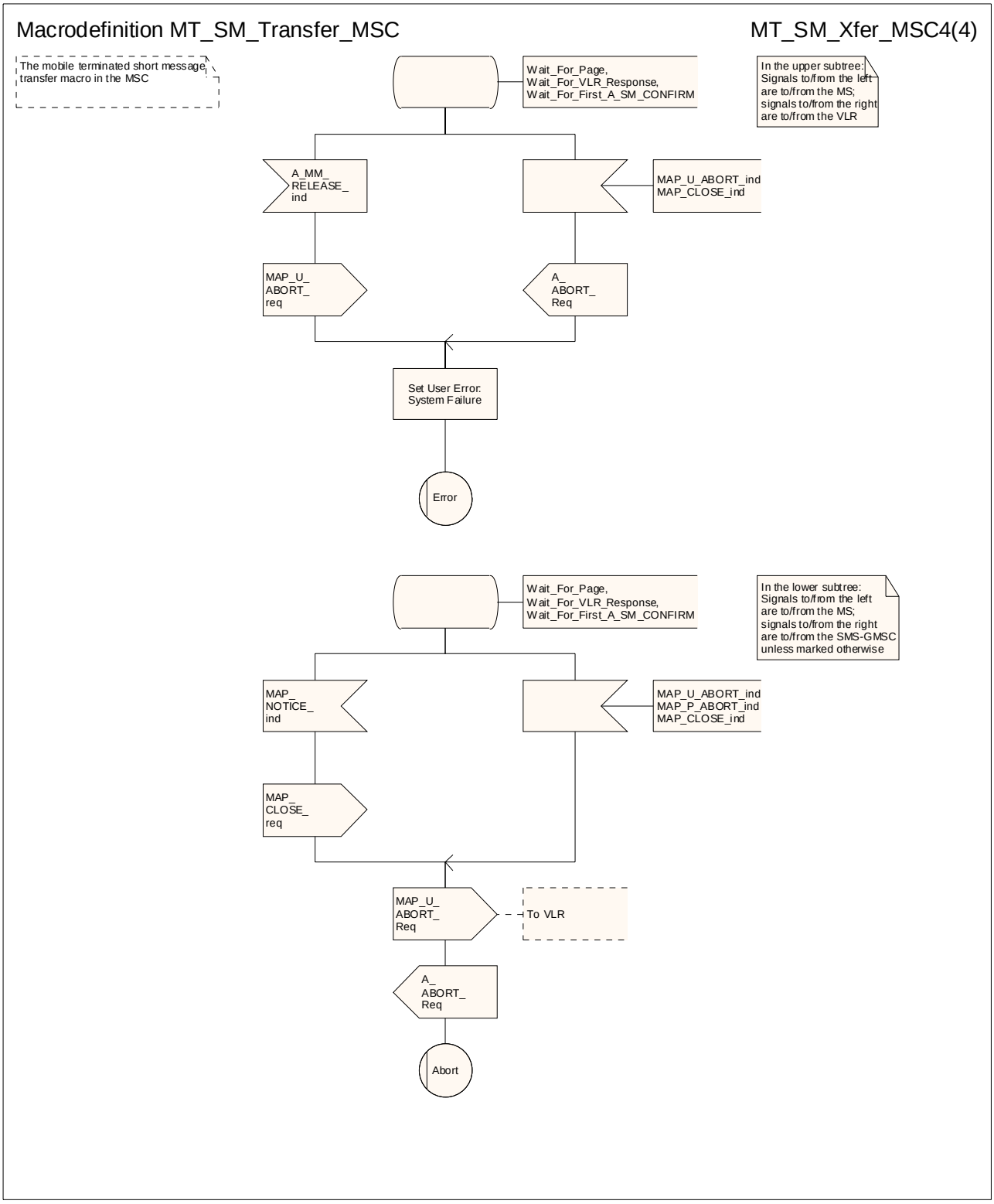


Figure ~~23.3/4~~23.3/7 (sheet 3 of 4): Macro MT_SM_Transfer_MSC


Macrodefinition MT_SM_Transfer_MSC
MT_SM_Xfer_MSC4(4)
The mobile terminated short message transfer macro in the MSC
Wait_For_Page,
Wait_For_VLR_Response,
Wait_For_First_A_SM_CONFIRM
In the upper subtree:
Signals to/from the left are to/from the MS;
signals to/from the right are to/from the VLR
A_MM_ RELEASE_ ind
MAP_ NOTICE_ ind
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
MAP_U_ ABORT_ req
MAP_ CLOSE_ req
A_ ABORT_ Req
Set User Error: System Failure
Error
Wait_For_Page,
Wait_For_VLR_Response,
Wait_For_First_A_SM_CONFIRM
In the lower subtree:
Signals to/from the left are to/from the MS;
signals to/from the right are to/from the SMS-GMSC unless marked otherwise
MAP_ NOTICE_ ind
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
MAP_ CLOSE_ req
MAP_U_ ABORT_ Req
To VLR
A_ ABORT_ Req
Abort

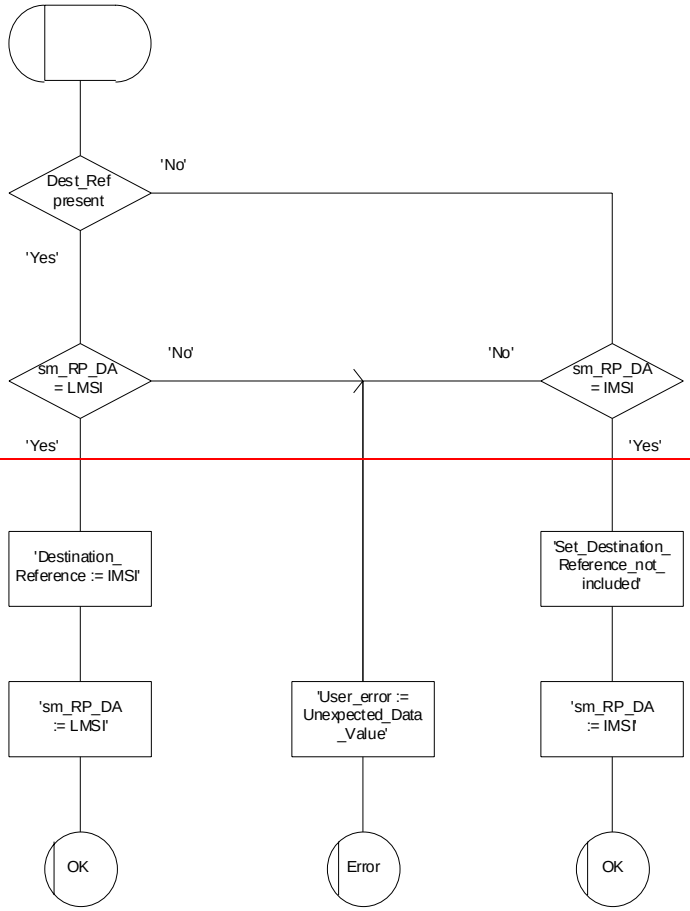


CR editor's note: the only change to this sheet is the size of the frame!

Figure ~~23.3/4~~23.3/7 (sheet 4 of 4): Macro MT_SM_Transfer_MSC

Macrodefinition Check_Subscr_Identity_For_MT_SMS 23.3_8(1)

Figure 23.3/8: Check of the subscriber identity for a mobile terminated short message in the servicing MSC and in the VLR



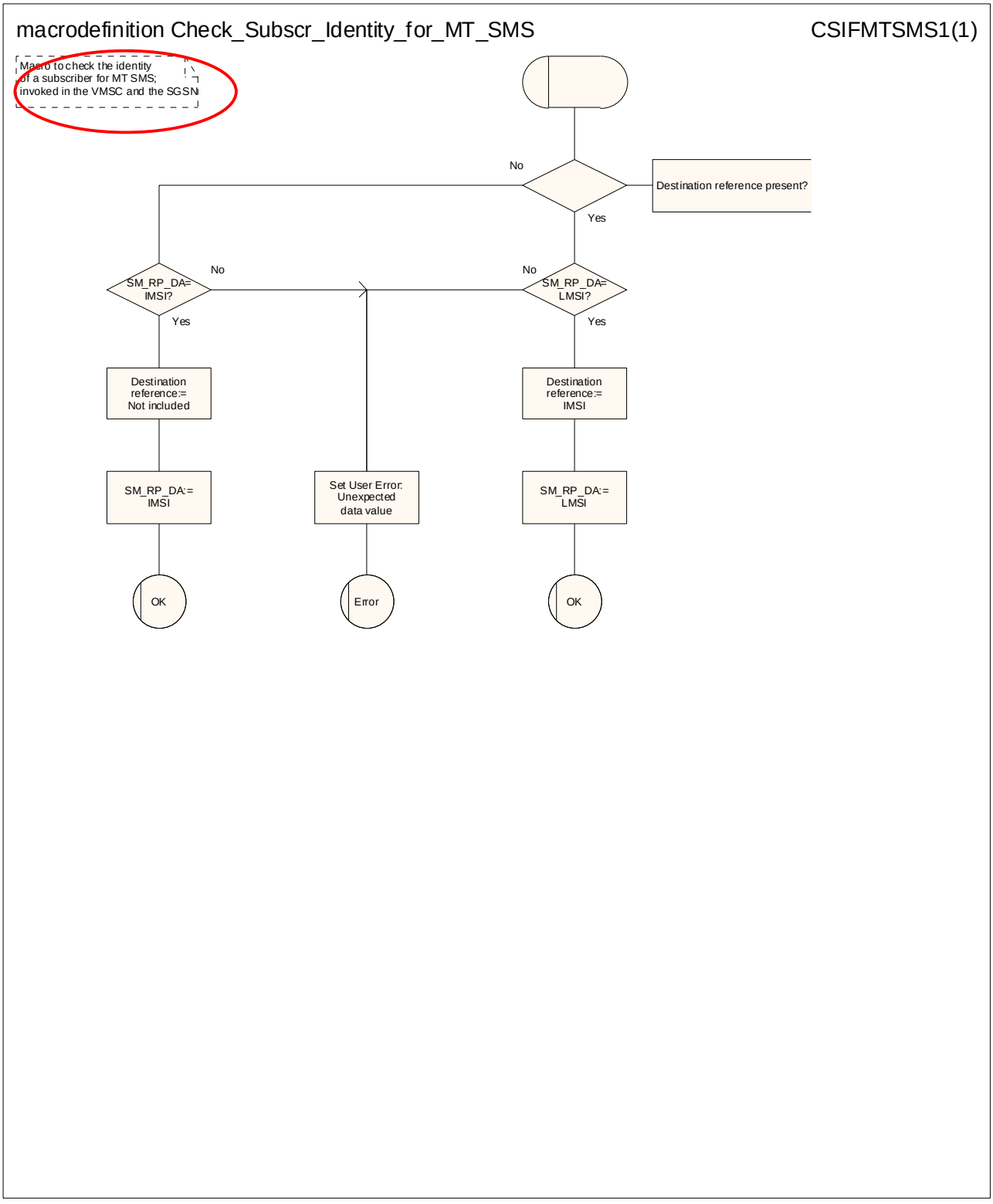


Figure 23.3/8: Macro Check_Subscr_Identity_For_MT_SMS

23.3.4~~2~~ Procedures in the VLR

Any CAMEL-specific handling defined in this subclause is omitted if the VLR does not support CAMEL control of MT~~O~~ SMS.

The process is triggered by a dialogue opening request from the MSC.

If the macro Receive_Open_Ind takes the "Vr" exit or the "Error" exit, the process returns to the Null state.

If the macro Receive_Open_Ind takes the "OK" exit, the VLR waits for a service primitive.

When the VLR receives a MAP_SEND_INFO_FOR_MT_SMS indication, it checks the indication.

- if the indication is badly formed, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the appropriate User Error, and the process returns to the Null state;
- if the indication is OK, the VLR checks the subscription information.

If the VLR has no record for the subscriber, or the subscriber record is marked as not confirmed by the HLR, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Unidentified subscriber", and the process returns to the Null state.

If the subscriber is marked as IMSI detached, or service is not allowed in the location area where the subscriber is currently registered, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Absent subscriber" with the diagnostic "IMSI detached", and the process returns to the Null state.

If the subscription checks are successful, the VLR calls the procedure CAMEL_MT_SMS_VLR, which is specified in 3GPP TS 23.078 [98], and checks the result.

- if the result is Fail, the process returns to the Null state;
- if the result is Pass, the VLR checks whether the location of the MS is known, and whether the location is confirmed by radio contact.
    - if the location is known and confirmed by radio contact, the VLR sends a MAP_PAGE request to the MSC;
    - if the location is not known, or not confirmed by radio contact, the VLR sends a MAP_SEARCH_FOR_MS request to the MSC.
- the VLR waits for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC.

When the VLR is waiting for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC:

- if the dialogue is aborted by the MSC, the process returns to the NULL state;
- if it receives a MAP_PAGE confirmation, it checks the User Error received in the confirmation, as below;
- if it receives a MAP_SEARCH_FOR_MS confirmation, it checks the confirmation.
    - if the confirmation contained a Provider Error or a Data Error, the process returns to the Null state;
    - if the confirmation contained a User Error, the VLR checks the User Error, as below;
    - if the confirmation indicated a successful result, the VLR updates the LAI and sets the Confirmed by Radio Contact indicator to Confirmed, and waits for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC.
- if it receives a MAP_PROCESS_ACCESS_REQUEST indication, it invokes the macro Process_Access_Request_VLR.
    - if the macro takes the "Error" exit, the process returns to the Null state;
    - if the macro takes the "OK" exit, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the MSISDN of the subscriber, and the process returns to the Null state.

If the VLR receives a MAP_PAGE confirmation or a MAP_SEARCH_FOR_MS confirmation containing a User Error, it checks the user error.

- if the User Error is Absent Subscriber, the VLR sets the MNRF and returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Absent subscriber" with diagnostic "No response to paging", and the process returns to the Null state;

- for any other User Error, the VLR relays the User Error in a MAP_SEND_INFO_FOR_MT_SMS response, and the process returns to the Null state.

~~When receiving the MAP_SEND_INFO_FOR_MT_SMS indication, the VLR will act as follows:~~

- ~~the parameters and data in the primitive are checked by the macro "Check_Indication". A data failure is reported as an unexpected data value error or a data missing error depending on the nature of the failure;~~

- ~~for mobile terminated short message the mobile subscriber is identified either by the IMSI only or by the IMSI accompanied by the LMSI. The subscriber identity information that may be included in the MAP_OPEN indication primitive and in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS". In the first case, the IMSI is included in the sm-RP-DA information field and the Destination Reference must not be present in the MAP_OPEN primitive. In the latter case the IMSI must be obtained from the Destination Reference of the MAP_OPEN indication primitive and an LMSI must be present in the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS indication. If the mobile subscriber is unknown, the unidentified subscriber error is returned;~~

- ~~if the "Confirmed by HLR" indicator is set to "Not Confirmed", the unidentified subscriber error is returned;~~

- ~~if the IMSI Detached Flag is set to detached or the LA Not Allowed Flag is set to not allowed in the VLR, an absent subscriber error with the diagnostic indication set to 'IMSI Detached' is returned and the MS not reachable flag (MNRF) is set;~~

- ~~if the MAP_SEND_INFO_FOR_MT_SMS indication has passed the tests and the subscriber is provisioned with MT-SMS-CSI in the VLR, then the VLR shall send MT-SMS-CSI to the MSC in order to have the MSC initiate a CAMEL dialogue with the CSE.~~

- ~~if the MAP_SEND_INFO_FOR_MT_SMS indication has passed all the tests, the VLR will initiate the paging procedure. If the location area identification is known and the "Confirmed by Radio Contact" indicator is set to "Confirmed", the MAP_PAGE service is used. Otherwise the MAP_SEARCH_FOR_MOBILE_SUBSCRIBER service is started.~~

~~The following responses to the paging procedure may be received from the MSC:~~

- ~~the MAP_SEARCH_FOR_MOBILE_SUBSCRIBER confirmation indicating a successful outcome, if the search procedure is used. After that the VLR awaits the MAP_PROCESS_ACCESS_REQUEST indication from the MSC;~~

- ~~the MAP_PAGE confirmation or MAP_SEARCH_FOR_MOBILE_SUBSCRIBER confirmation indicating unsuccessful outcome. If an absent subscriber error is received, the MS not reachable flag (MNRF) is set in the VLR. The errors are forwarded to the MSC in the MAP_SEND_INFO_FOR_MT_SMS response, the absent subscriber error is forwarded with the diagnostic indication set to 'No Paging Response for non GPRS'. If the unexpected data value, or unknown location area error is received, the system failure indication is given to the MSC; if subscriber busy for MT SMS is received, this cause is given to the MSC.~~

- ~~the MAP_PROCESS_ACCESS_REQUEST indication telling that the outcome of the service MAP_PAGE is successful.~~

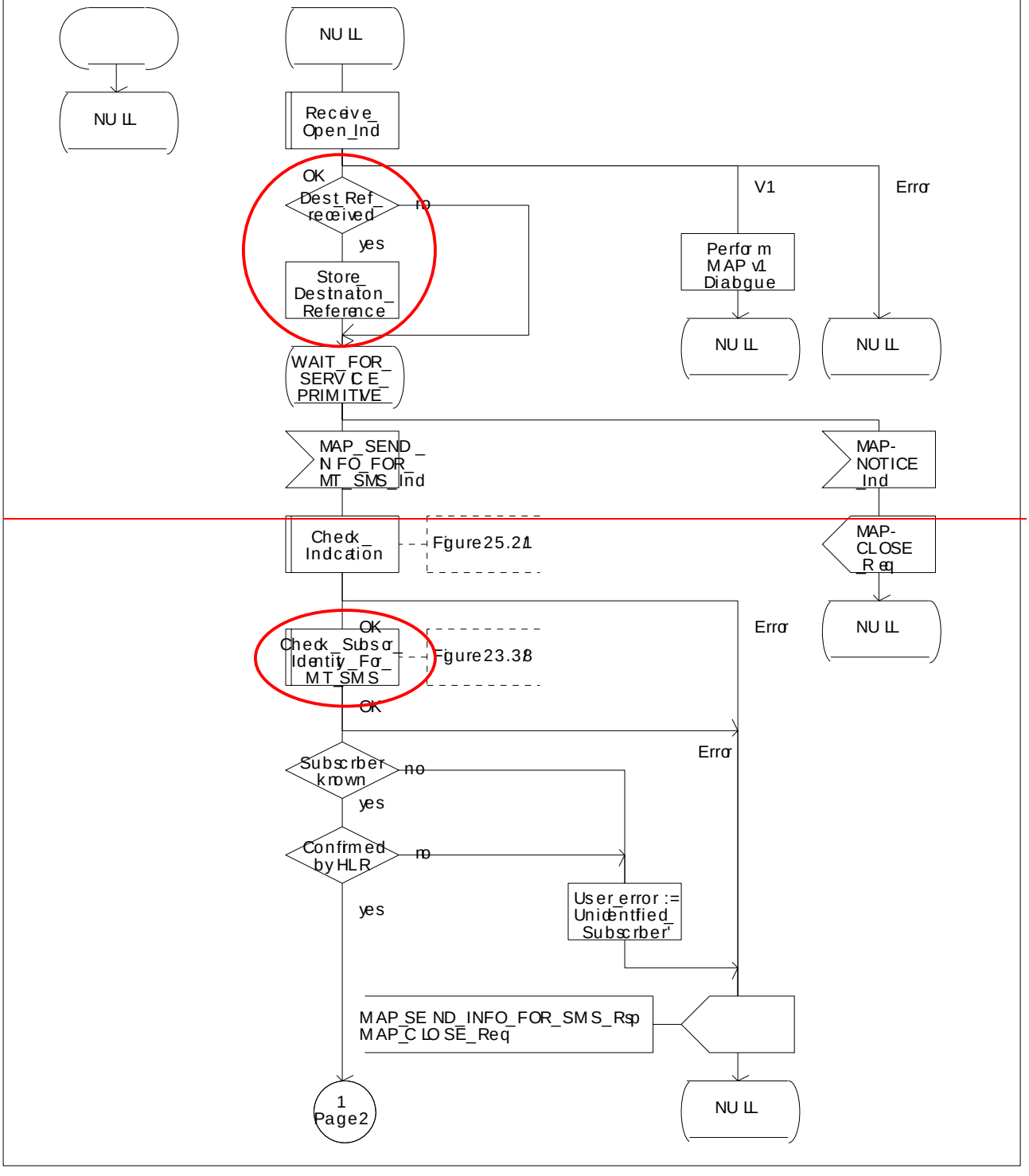
~~If the paging procedure or process access request procedure or any other procedure invoked fails, the appropriate error is reported to the MSC.~~

~~If the process access request procedure is successful, the VLR will send the MAP_SEND_INFO_FOR_MT_SMS response to the MSC and the transaction is terminated in the VLR.~~

The mobile terminated short message transfer proces~~sdure~~ in the VLR is shown in figure ~~23.3/5~~23.3/9.

Process MT_SM_VLR 23.3_5.1(3)

Figure 233/5:The mobileterminated short messageservice process in the VLR



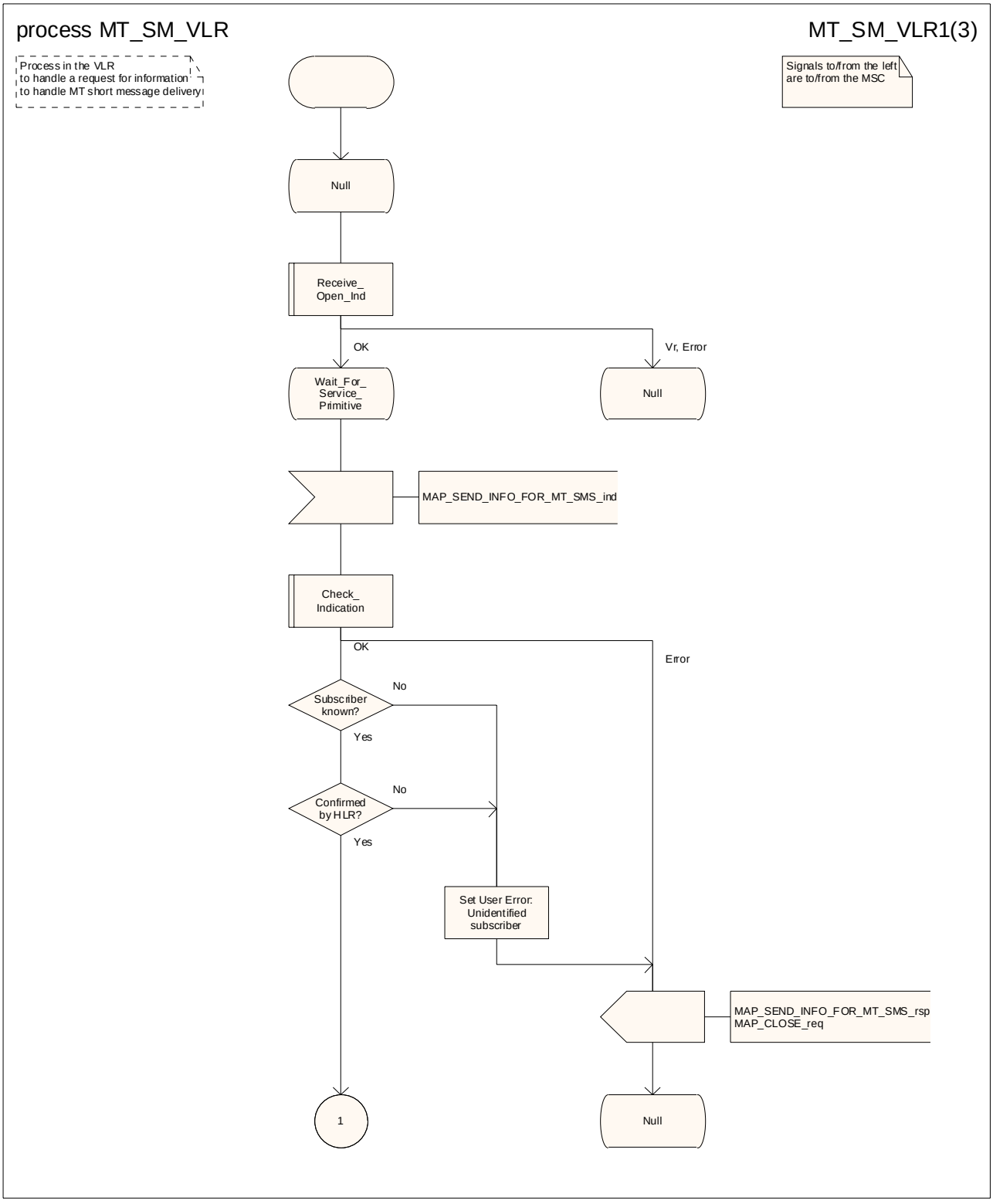
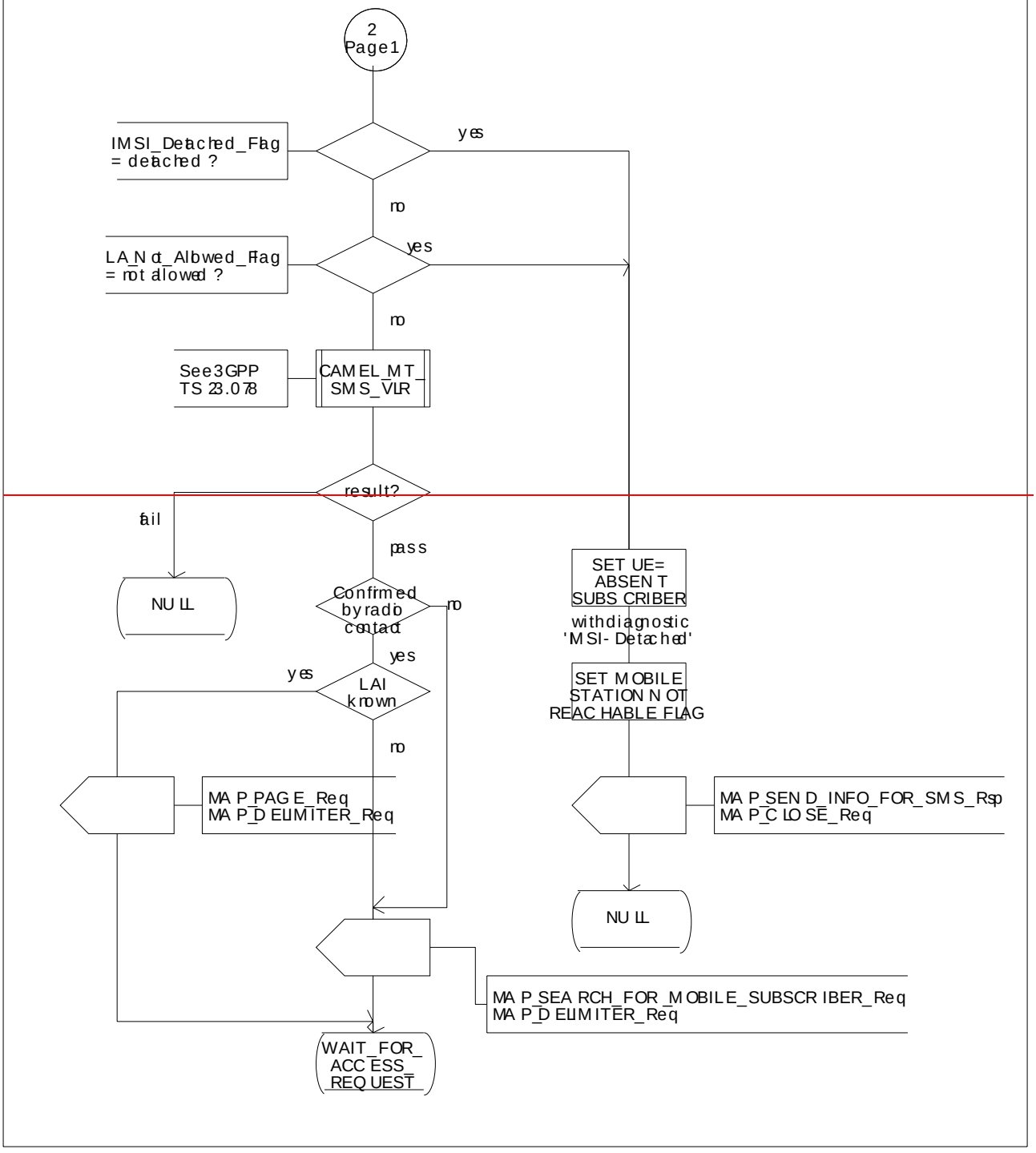


Figure ~~23.3/5~~23.3/9 (sheet 1 of 3): Process MT_SM_VLR

Process MT_SM_VLR 23.3_5.2(3)

Figure 23.3/5: The mobile terminated short message service process in the VLR



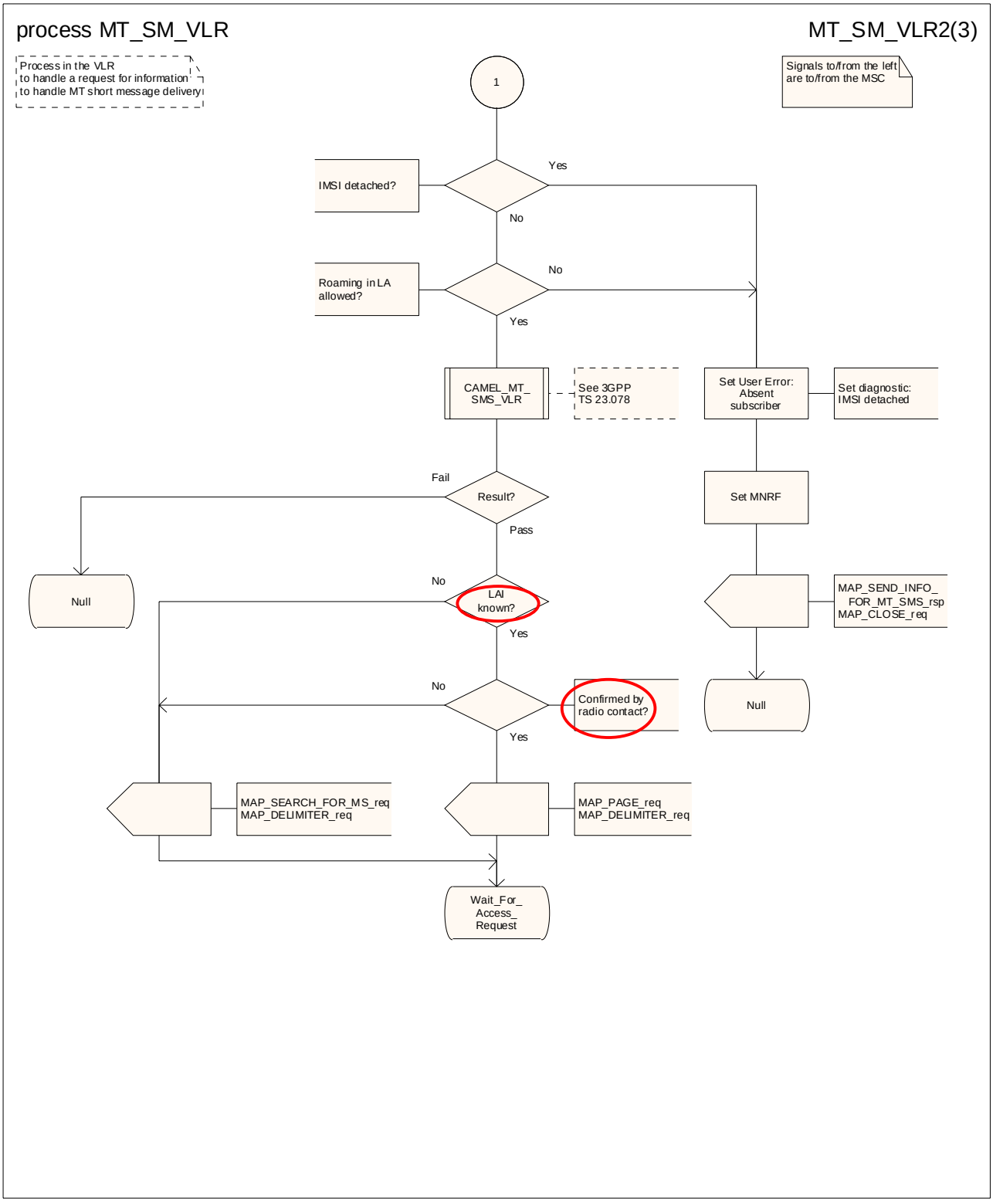
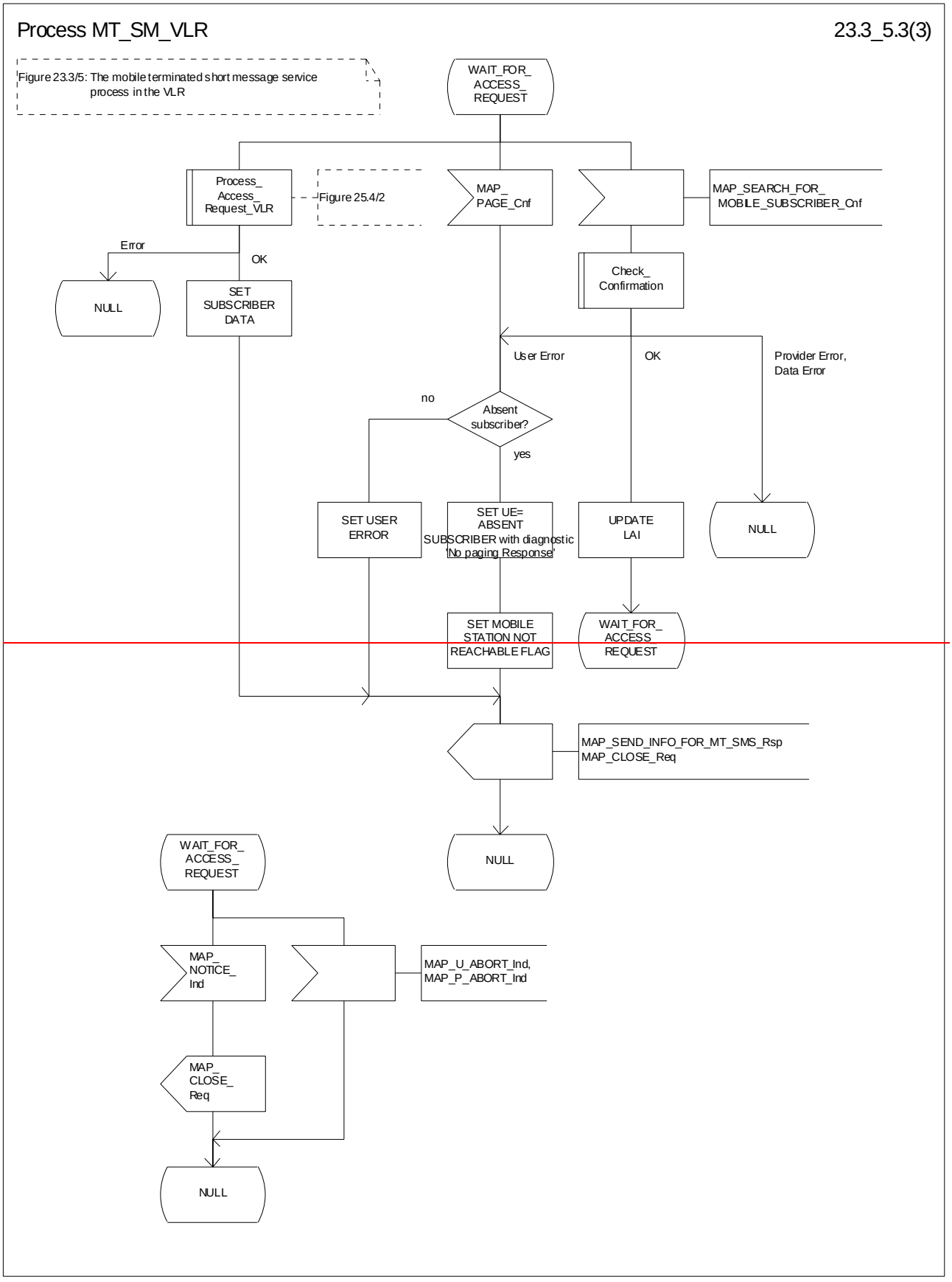


Figure ~~23.3/5~~23.3/9 (sheet 2 of 3): Process MT_SM_VLR


Process MT_SM_VLR
23.3_5.3(3)
Figure 23.3/5: The mobile terminated short message service process in the VLR
WAIT_FOR_ ACCESS_ REQUEST
Process_ Access_ Request_VLR
Figure 25.4/2
MAP_ PAGE_Cnf
MAP_SEARCH_FOR_ MOBILE_SUBSCRIBER_Cnf
Error
OK
NULL
SET SUBSCRIBER DATA
Check_ Confirmation
User Error
OK
Provider Error, Data Error
no
Absent subscriber?
yes
SET USER ERROR
SET UE= ABSENT SUBSCRIBER with diagnostic 'No paging Response'
UPDATE LAI
NULL
SET MOBILE STATION NOT REACHABLE FLAG
WAIT_FOR_ ACCESS_ REQUEST
MAP_SEND_INFO_FOR_MT_SMS_Rsp
MAP_CLOSE_Req
NULL
WAIT_FOR_ ACCESS_ REQUEST
MAP_ NOTICE_ Ind
MAP_U_ABORT_Ind, MAP_P_ABORT_Ind
MAP_ CLOSE_ Req
NULL

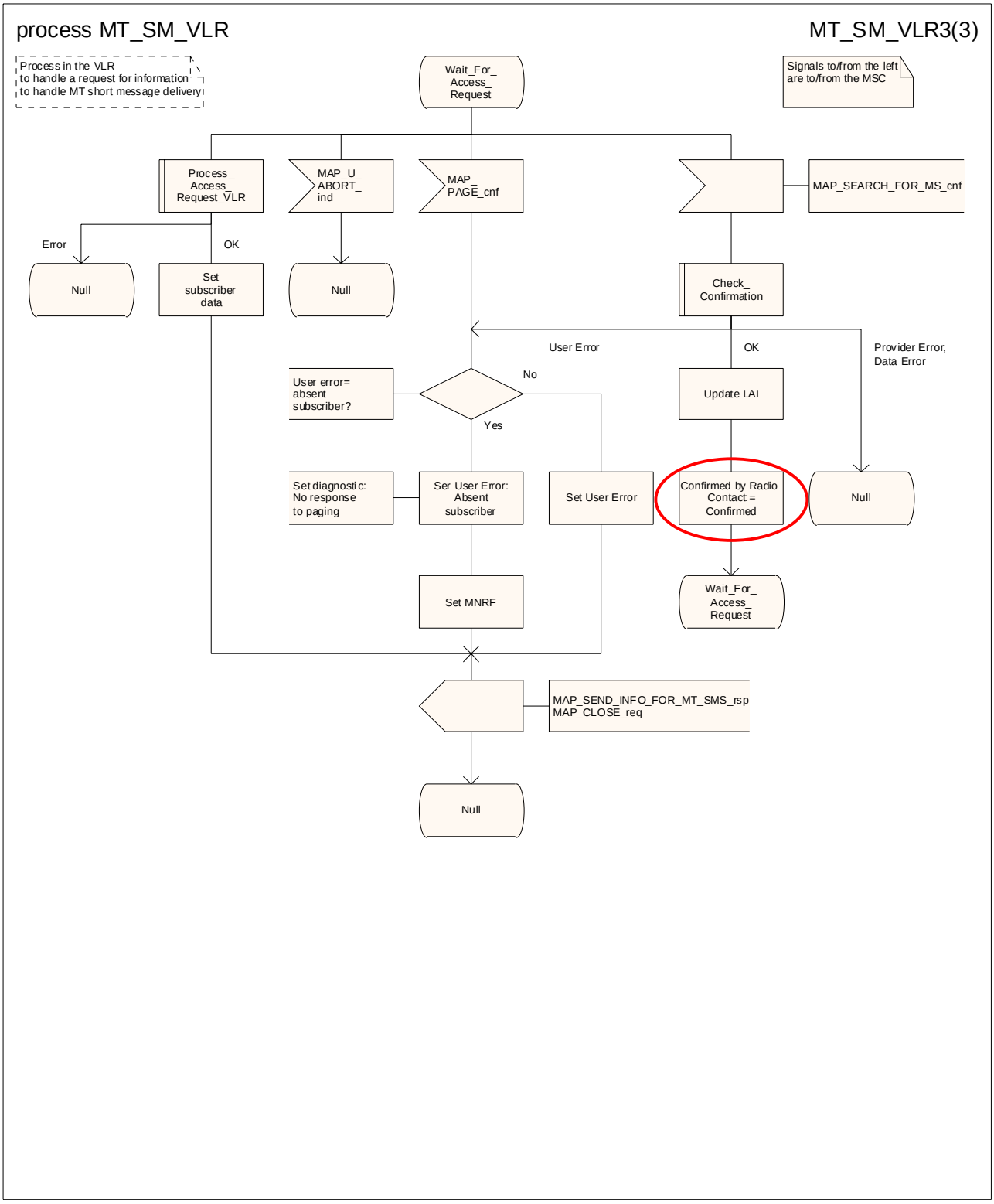


Figure ~~23.3/5~~23.3/9 (sheet 3 ~~t~~of 3): Process MT_SM_VLR

23.3.5 Procedure in the ~~Serving~~ SGSN

Any CAMEL-specific handling defined in this subclause is omitted if the SGSN does not support CAMEL control of MT SMS, or if the subscriber does not have a subscription for CAMEL control of MT SMS.

The process is triggered by a dialogue opening request with the application context shortMsgMT-RelayContext.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the SGSN checks whether the dialogue opening request included a destination reference. If a destination reference was included, the SGSN stores it and waits for a service primitive.
  - if the dialogue with the SMS-GMSC fails, the process returns to the Null state;
  - if the next primitive received is a MAP_DELIMITER indication, the SGSN returns a MAP_DELIMITER request, and waits for a service primitive;
  - if the next primitive received is a MAP_MT_FORWARD_SHORT_MESSAGE indication, the SGSN checks the indication.
    - if the indication is badly formed, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
    - if the indication is OK, the MSC invokes the macro MT_SM_Transfer_SGSN to transfer the short message to the MS.
      - if the macro takes the "Release SMS" exit, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
      - if the macro takes the "Error" exit, the SGSN reports the delivery failure to the gsmSCF (if CAMEL handling was invoked) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
      - if the macro takes the "Abort" exit, the SGSN reports the delivery failure to the gsmSCF (if CAMEL handling was invoked), and the process returns to the Null state;
      - if the macro takes the "OK" exit, the SGSN reports the successful delivery to the gsmSCF (if CAMEL handling was invoked) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".
        - if there are no more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;
        - if there are more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.
- When the SGSN is waiting for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC:
  - if the dialogue with the SMS-GMSC fails, the SGSN releases the LLC connection to the MS, and the process returns to the Null state;
  - if it receives a Release indication over the Gb-interface, the SGSN aborts the dialogue with the SMS-GMSC, and the process returns to the Null state;
  - if it receives a MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC, it checks the indication.

- if the indication is badly formed, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
- if the indication is OK, the SGSN checks whether CAMEL handling is required.
  - if CAMEL handling is required, the SGSN calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.
    - if the result is Release_SMS, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error defined by the gsmSCF, and the process returns to the Null state;
    - if the result is Continue, the SGSN forwards the short message to the MS over the Gb interface, as described below.
  - if CAMEL handling is not required, the SGSN forwards the short message to the MS over the Gb interface, as described below;
- the SGSN sends a Gb_RP_MT_DATA request to the MS, and waits for the response from the MS.

- When the SGSN is waiting for the response from the MS for delivery of a subsequent short message:
  - if the dialogue with the SMS-GMSC fails, the the SGSN releases the LLC connection to the MS and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the SGSN receives a Release indication over the Gb-interface, the MSC aborts the dialogue with the SMS-GMSC and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the SGSN receives an error response from the MS, it maps the error to a MAP user error, reports the delivery failure to the gsmSCF (if CAMEL handling is required) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error, and the process returns to the Null state;
  - if the SGSN receives a positive acknowledgement from the MS, it reports the successful delivery to the gsmSCF (if CAMEL handling is required) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".
    - if there are no more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;
    - if there are more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.

~~When initiating the dialogue with the serving SGSN, the SMS-GMSC must provide the IMSI of the subscriber to whom the short message is directed.~~

~~The IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication.~~

~~When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service user in the serving SGSN issues a MAP_DELIMITER request primitive in order to trigger the local MAP service provider to confirm the dialogue.~~

~~When receiving the first MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-MSC, the serving SGSN performs some subscriber data checks, if the MAP service primitive is accepted and if short message service is supported in the serving SGSN.~~

~~The MAP_MT_FORWARD_SHORT_MESSAGE indication primitive is checked by the macro "Check_Indication". If the received MAP service primitive contains errors, the service is aborted and an unexpected data value error or data missing error is returned to the SMS-GMSC.~~

If the SGSN does not support the short message service, the service is aborted in the serving SGSN and the error "Facility Not Supported" is returned to the SMS-GMSC.

If the connection is GPRS suspended, the SGSN sends to the SMS-GMSC an error specifying that the GPRS connection is suspended.

The subscriber identity information included in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS" as follows:

If the IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication, the MAP_OPEN indication received from the SMS-GMSC shall not include a Destination Reference.

If no Destination Reference has been received and the sm-RP-DA information field does not include an IMSI the service is aborted in the serving SGSN and the error "Unexpected Data Value" is returned to the SMS-GMSC.

The following outcomes from the subscriber data checks can occur in SGSN:

- if the mobile subscriber is unknown, the unidentified subscriber error is forwarded to the SMS-GMSC;
- if the “Confirmed by HLR” indicator is set to “Not Confirmed”, the unidentified subscriber error is forwarded to the SMS-GMSC.
- if the GPRS Detached Flag is set to detached or the LA Not Allowed Flag is set to not allowed in the SGSN, an absent subscriber error with the diagnostic indication set to 'GPRS Detached' is forwarded to the SMS-GMSC and the MS not reachable for GPRS (MNRG) flag is set;
- If the location area identification is known and the "Confirmed by Radio Contact" indicator is set to "Confirmed", the paging procedure is invoked. Otherwise the search procedure is invoked.

After the subscriber data checks the SGSN checks whether a CAMEL dialogue should be opened as specified in 3GPP TS 23.078. If required, the SGSN opens a CAMEL dialogue as specified in 3GPP TS 23.078. If the CAMEL service bars the MT SM then the failure is reported to the SMS-GMSC, and the MT SM is not delivered to MS.

The result of the paging or the search procedure is processed as follows:

- if the procedure is completed successfully, the SGSN may trigger the Authentication, Ciphering and IMEI check procedures (see clauses 25.4 and 25.5). Then, if the procedures are completed successfully, the SGSN will send the short message to the MS;
- if the procedure is completed successfully, but the MS has no mobile terminated short message transfer capability, the SM delivery failure indication with cause "equipment not SM equipped" is provided to the SMS-GMSC. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;
- if the procedure is ended unsuccessfully because the subscriber is already busy for SMS or engaged in location updating or inter SGSN routing area update, the SGSN sends a subscriber busy for MT SMS error to the SMS-GMSC. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;
- if the procedure is ended unsuccessfully because there is no response to paging, the SGSN sends an absent subscriber_SM error to the SMS-GMSC with the absent subscriber diagnostic indication set to 'No Paging Response for GPRS'; if the location area is unknown, the SGSN sends a system failure error to the SMS-GMSC. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078.

If forwarding of the short message is initiated, the SGSN awaits the result before one of the following responses is sent back to the SMS-GMSC:

- an acknowledgement if the short message has been successfully delivered to the mobile subscriber. The successful MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;
- an SM delivery failure error containing a parameter indicating either of the following: there is a MS protocol error or the MS memory capacity is exceeded; detailed diagnostic information (see clause 7.6.1.4) may also be carried. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;
- a system failure error if the delivery procedure is aborted. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078.

~~If the More Messages To Send flag was FALSE or the service MAP_MT_FORWARD_SHORT_MESSAGE ends unsuccessfully, the transaction to the SMS-GMSC is terminated. If the More Messages To Send flag was TRUE, then the serving SGSN waits for the next short message from the Service Centre.~~

~~When receiving the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC the serving SGSN will act as follows:~~

- ~~if the received primitive contains errors, the unexpected data value error or data missing error is provided to the SMS-GMSC;~~
- ~~the SGSN opens a CAMEL dialogue as specified in 3GPP TS 23.078 for each SM. If the CAMEL service bars the MT-SM then the failure is reported to the SMS-GMSC, and the MT-SM is not delivered to the MS.~~
- ~~if the More Messages To Send flag is FALSE, the serving SGSN will start the short message transfer procedure to the mobile subscriber. The successful or unsuccessful outcome of this procedure is reported to the gsmSCF as specified in 3GPP TS 23.078 and to the SMS-GMSC, and the transaction is terminated.~~
- ~~if the More Messages To Send flag is TRUE, the serving SGSN will start the short message transfer to the mobile subscriber. If the outcome of this procedure is unsuccessful, the SM delivery failure is reported to the gsmSCF and the reason is reported to the SMS-GMSC and the procedure is terminated. If the procedure is successful, then the MT-SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078, and it is acknowledged to the SMS-GMSC and more short messages can be received.~~

The mobile terminated short message transfer procedure in the serving SGSN is shown in figure~~s 23.3/9~~23.3/10 ~~and 23.3/10~~.

The macro MT_SM_Transfer_SGSN is used to transfer the first MT short message of a possible sequence of messages.

If the SGSN does not support MT SMS, it sets the User Error to "Facility not supported" and the macro takes the "Error" exit.

If the SGSN supports MT SMS, it invokes the macro Check_Subscr_Identity_for_SMS.

- if the macro Check_Subscr_Identity_for_SMS takes the "Error" exit, the macro MT_SM_Transfer_SGSN takes the "Error" exit;
- if the macro Check_Subscr_Identity_for_SMS takes the "OK" exit, the SGSN checks the subscription information.
  - if the SGSN has no record for the subscriber, or the subscriber record is marked as not confirmed by the HLR, the SGSN sets the User Error to "Unidentified subscriber", and the macro takes the "Release SMS" exit;
  - if the subscriber is marked as GPRS detached, or service is not allowed in the routeing area where the subscriber is currently registered, the SGSN sets the User Error to "Absent subscriber" with the diagnostic "GPRS detached" and sets the MNRG flag, and the macro takes the "Release SMS" exit.
- if the subscription checks are successful, the SGSN calls the procedure CAMEL_MT_SMS_SGSN, which is specified in 3GPP TS 23.078 [98], and checks the result.
  - if the result is Continue, the SGSN sets the variable CAMEL Handling to False, and continues the processing for the delivery attempt;
  - if the result is CAMEL Handling, the SGSN sets the variable CAMEL Handling to True, calls the procedure CAMEL_T_SMS_INIT and checks the result.
    - if the result is Release_SMS, the SGSN sets the User Error according to the instructions from the gsmSCF, and the macro takes the "Release SMS" exit;
    - if the result is Continue, the SGSN continues the processing for the delivery attempt.
- the SGSN checks whether the location of the MS is known, and whether the location is confirmed by radio contact.
  - if the location is known and confirmed by radio contact, the SGSN calls the procedure Page_SMS_SGSN and checks the result;

- if the location is not known, or not confirmed by radio contact, the SGSN calls the procedure Search_SMS_SGSN and checks the result.

- if the procedure Page_SMS_SGSN or the procedure Search_SMS_SGSN returns a Fail result, the SGSN checks the error cause.

  - if the error cause is Absent Subscriber, the SGSN sets the User Error to "Absent Subscriber" with the diagnostic "No response to paging" and sets the MNRG flag, and the macro takes the "Error" exit;

  - for any other error, the SGSN sets the User Error accordingly, and the macro takes the "Error" exit.

- if the procedure Page_SMS_SGSN or the procedure Search_SMS_SGSN returns a Fail result, the SGSN checks whether the MS supports SMS.

  - if the MS does not support SMS, the SGSN releases the LLC connection and sets the User Error to "SM delivery failure" with delivery failure cause "Equipment not SM equipped", and the macro takes the "Error" exit;

  - if the MS supports SMS, the SGSN forwards the short message to the MS, and waits for a response from the MS.

    - if the MS returns an error, the SGSN sets the User Error according to the response from the MS, and the macro takes the "Error" exit;

    - if the MS returns a positiva acknowledgement, the macro takes the "OK" exit;

    - if the LLC connection is released, the SGSN sets the User Error to "System failure", and the macro takes the "Error" exit;

    - if the dialogue with the SMS-GMSC fails, the SGSN releases the LLC connection, and the macro takes the "Abort" exit.

The macro MT_SM_Transfer_SGSN is shown in figure 23.3/11

The page and search procedures are shown in figures ~~23.3/10a~~23.3/12 and ~~23.3/10b~~23.3/13.

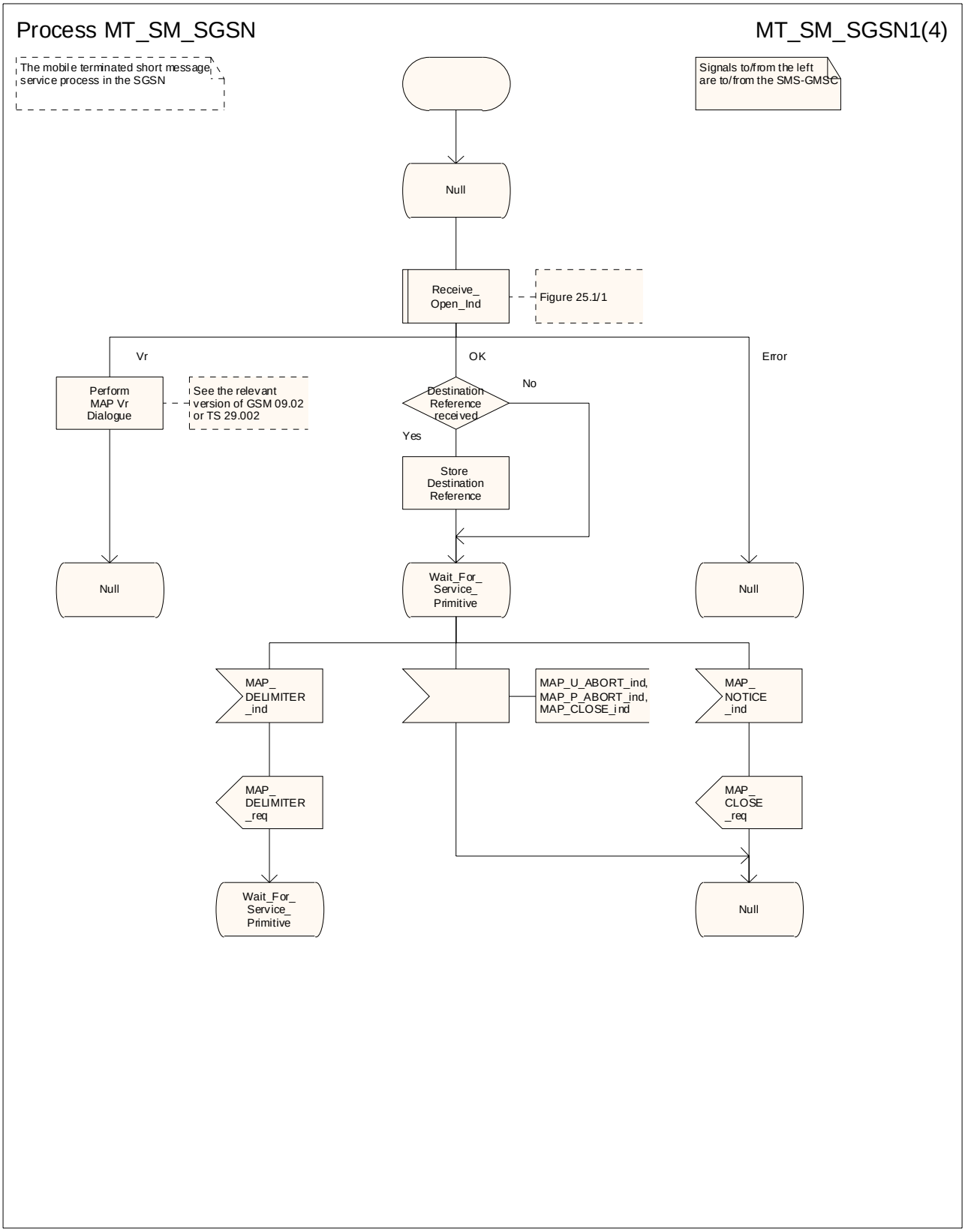


Figure ~~23.3/9~~23.3/10 (sheet 1 of 4): Process MT_SM_SGSN

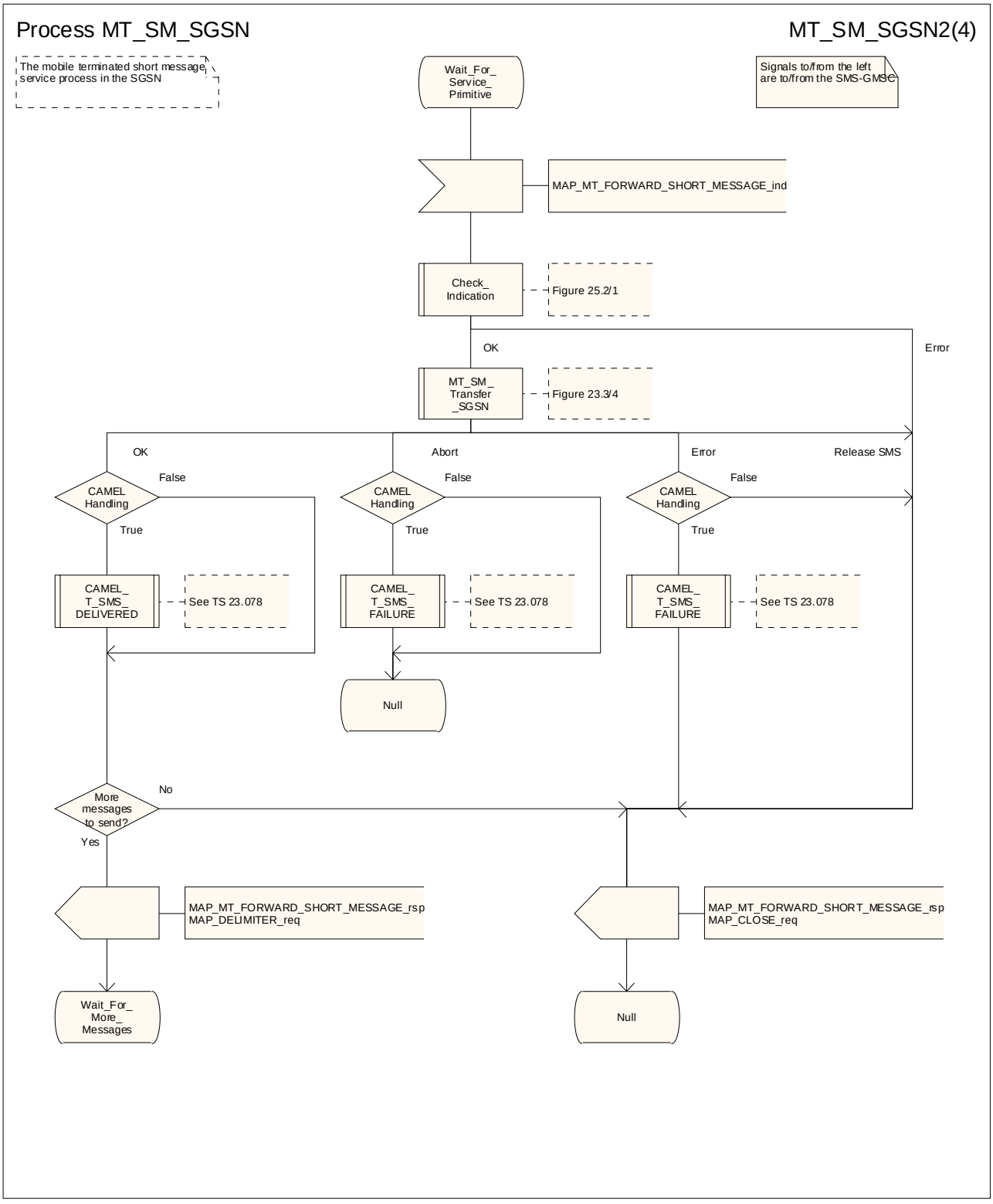
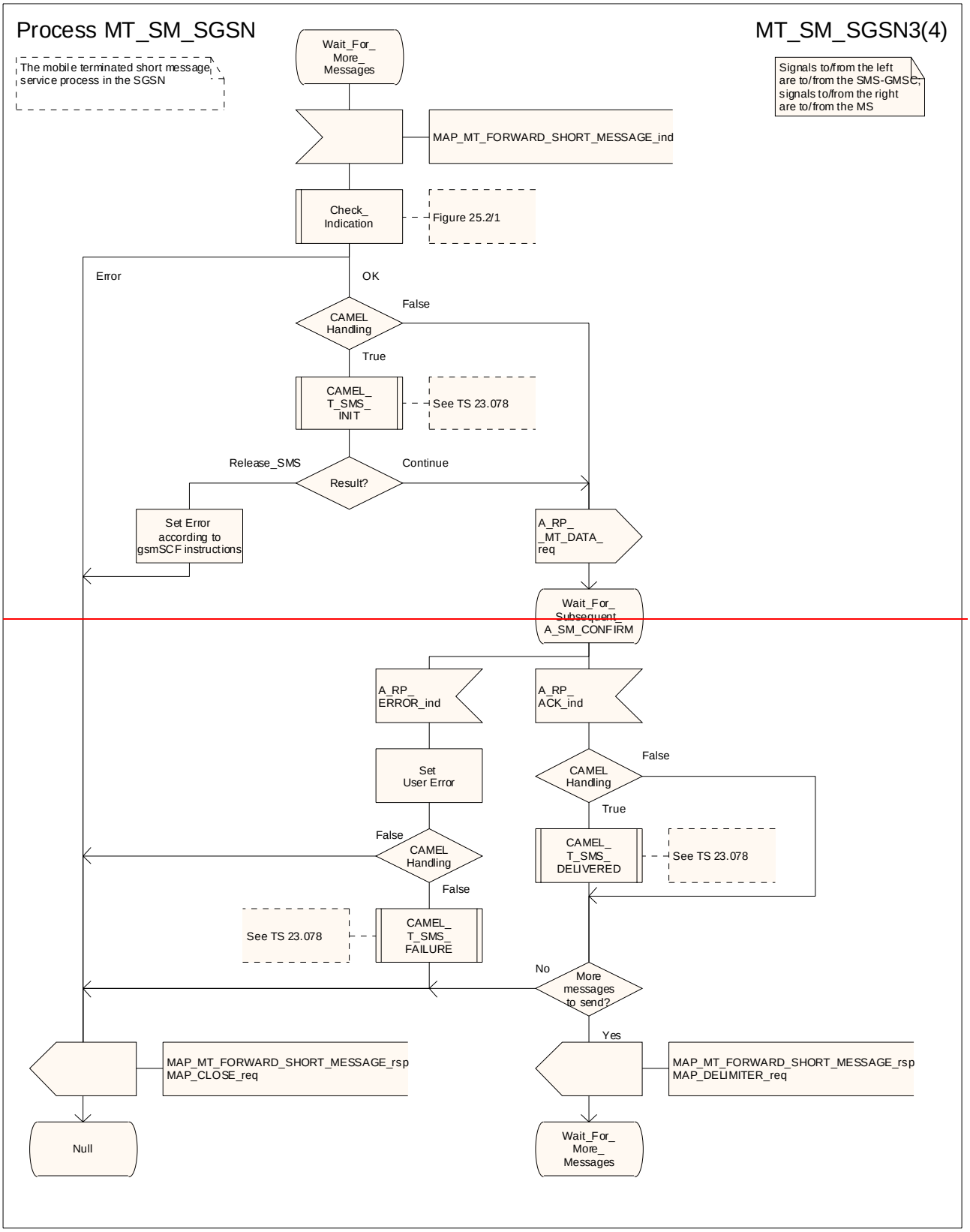


Figure ~~23.3/9~~23.3/10 (sheet 2 of 4): Process MT_SM_ SGSN


Process MT_SM_SGSN
MT_SM_SGSN3(4)
The mobile terminated short message service process in the SGSN
Signals to/from the left are to/from the SMS-GMSC, signals to/from the right are to/from the MS
Wait_For_ More_ Messages
MAP_MT_FORWARD_SHORT_MESSAGE_ind
Check_ Indication
Figure 25.2/1
Error
OK
CAMEL Handling
False
True
CAMEL_ T_SMS_ INIT
See TS 23.078
Release_SMS
Result?
Continue
Set Error according to gsmSCF instructions
A_RP_ _MT_DATA_ req
Wait_For_ Subsequent_ A_SM_CONFIRM
A_RP_ ERROR_ind
A_RP_ ACK_ind
Set User Error
CAMEL Handling
False
True
False
CAMEL Handling
CAMEL_ T_SMS_ DELIVERED
See TS 23.078
False
See TS 23.078
CAMEL_ T_SMS_ FAILURE
No
More messages to send?
Yes
MAP_MT_FORWARD_SHORT_MESSAGE_rsp MAP_CLOSE_req
MAP_MT_FORWARD_SHORT_MESSAGE_rsp MAP_DELIMITER_req
Null
Wait_For_ More_ Messages

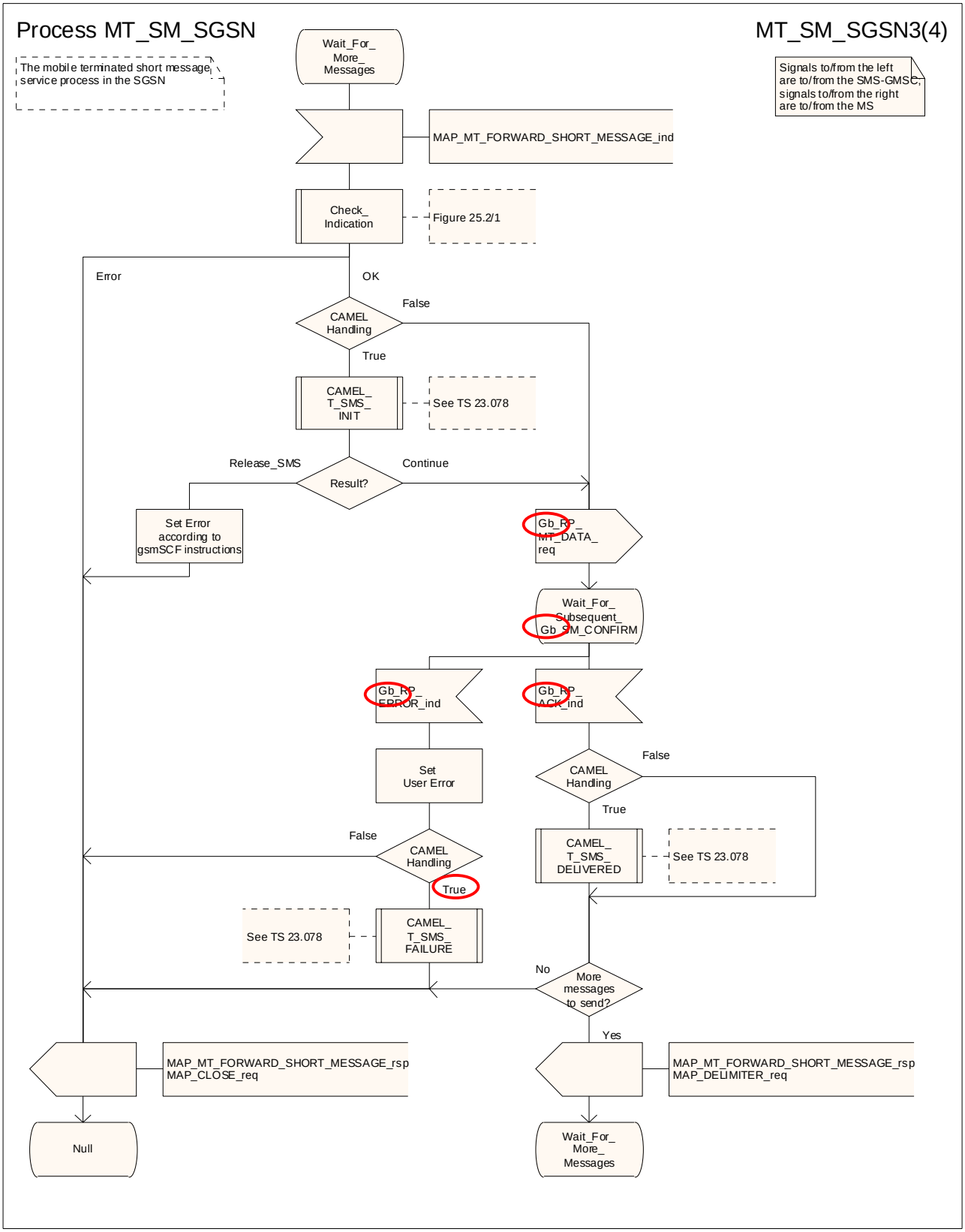
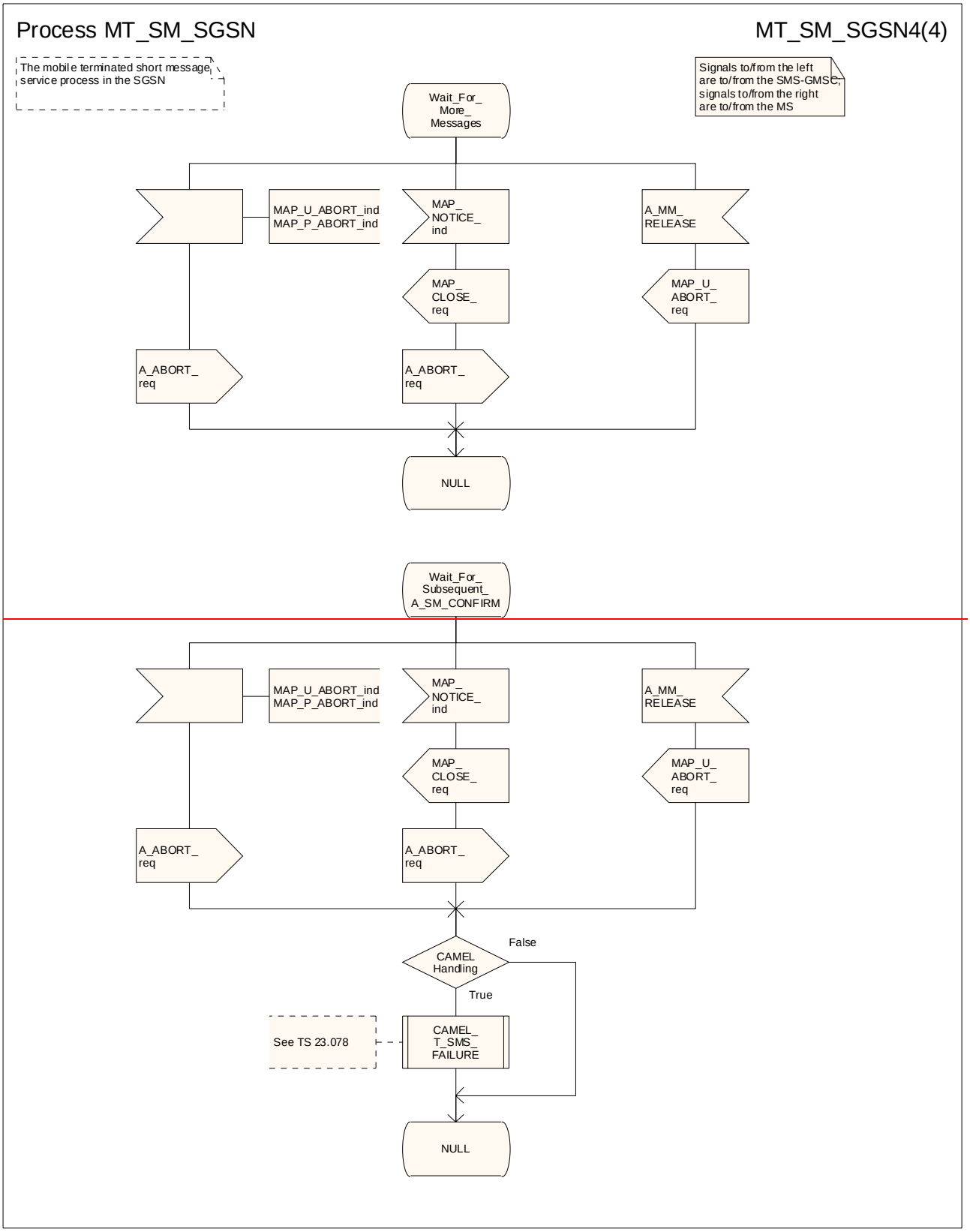


Figure ~~23.3/9~~23.3/10 (sheet 3 of 4): Process MT_SM_ SGSN


Process MT_SM_SGSN
MT_SM_SGSN4(4)
The mobile terminated short message service process in the SGSN
Signals to/from the left are to/from the SMS-GMSC; signals to/from the right are to/from the MS
Wait_For_ More_ Messages
MAP_U_ABORT_ind MAP_P_ABORT_ind
MAP_ NOTICE_ ind
A_MM_ RELEASE
MAP_ CLOSE_ req
MAP_U_ ABORT_ req
A_ABORT_ req
A_ABORT_ req
NULL
Wait_For_ Subsequent_ A_SM_CONFIRM
MAP_U_ABORT_ind MAP_P_ABORT_ind
MAP_ NOTICE_ ind
A_MM_ RELEASE
MAP_ CLOSE_ req
MAP_U_ ABORT_ req
A_ABORT_ req
A_ABORT_ req
CAMEL Handling
False
True
See TS 23.078
CAMEL_ T_SMS_ FAILURE
NULL

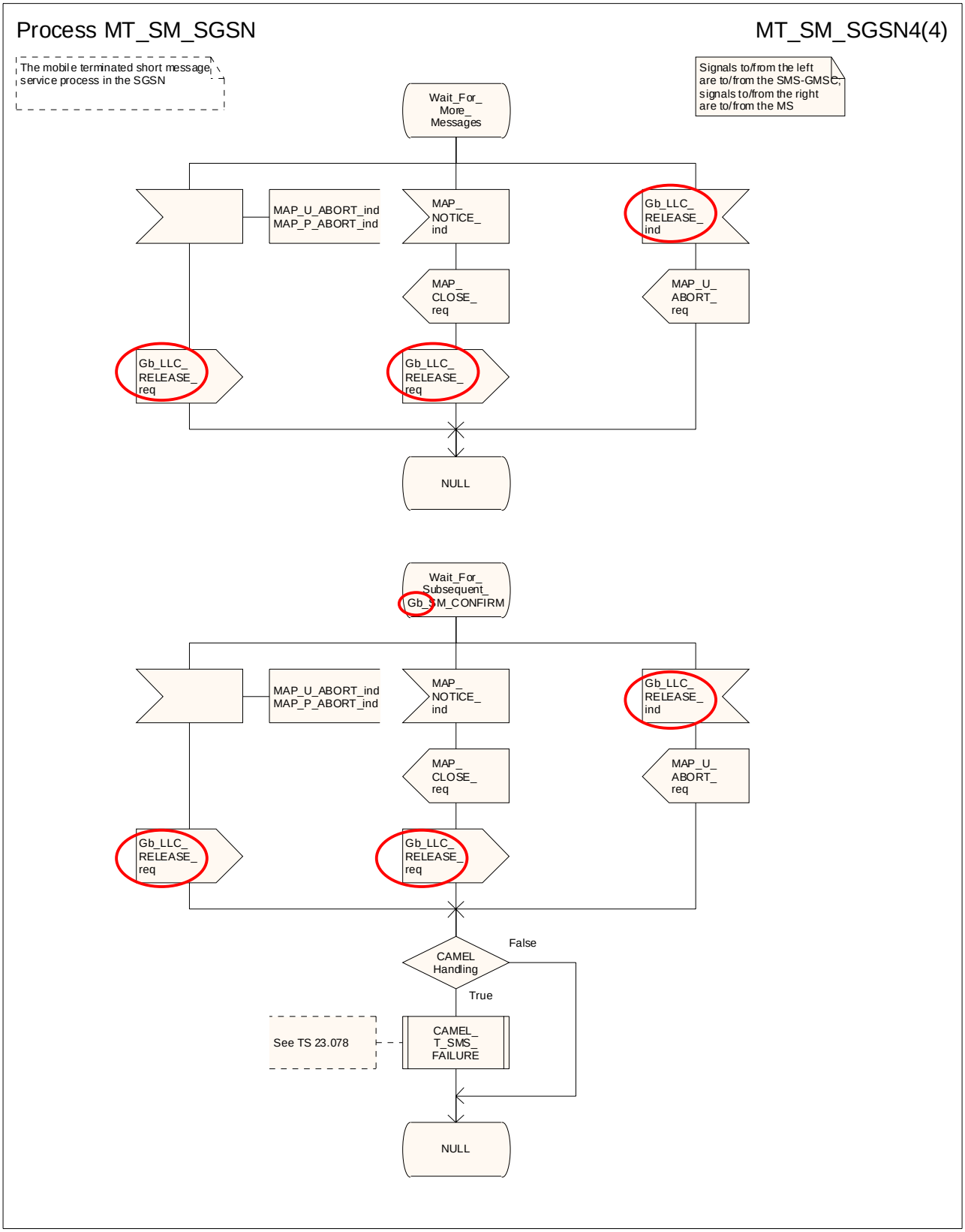
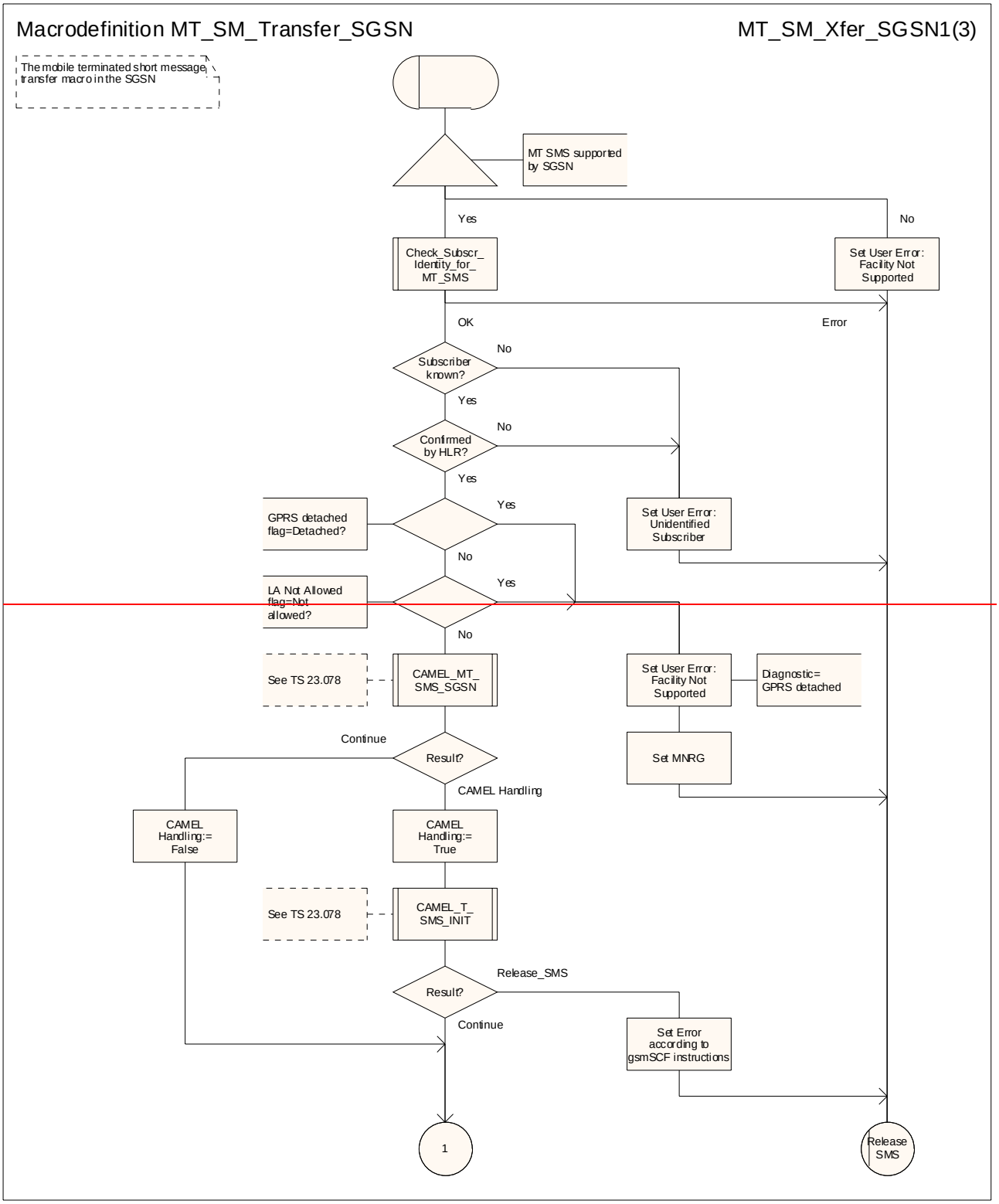


Figure ~~23.3/9~~23.3/10 (sheet 4 of 4): Process MT_SM_ SGSN


Macrodefinition MT_SM_Transfer_SGSN
MT_SM_Xfer_SGSN1(3)
The mobile terminated short message transfer macro in the SGSN
MT SMS supported by SGSN
Yes
No
Check_Subscr_ Identity_for_ MT_SMS
Set User Error: Facility Not Supported
OK
Error
Subscriber known?
No
Yes
Confirmed by HLR?
No
Yes
GPRS detached flag=Detached?
Yes
Set User Error: Unidentified Subscriber
No
LA Not Allowed flag=Not allowed?
Yes
No
See TS 23.078
CAMEL_MT_ SMS_SGSN
Set User Error: Facility Not Supported
Diagnostic= GPRS detached
Continue
Result?
Set MNRG
CAMEL Handling
CAMEL Handling:= False
CAMEL Handling:= True
See TS 23.078
CAMEL_T_ SMS_INIT
Release_SMS
Result?
Continue
Set Error according to gsmSCF instructions
1
Release SMS

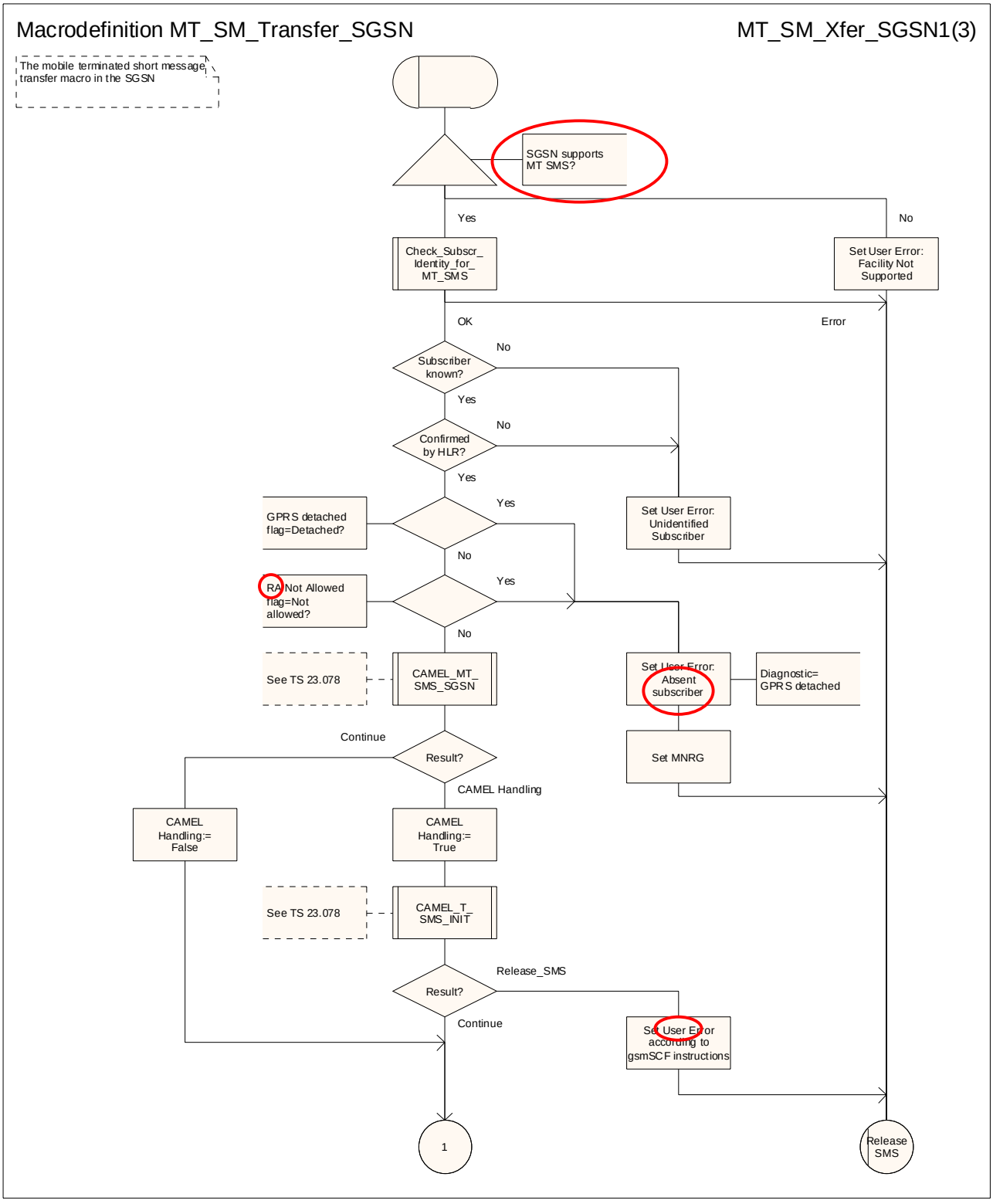
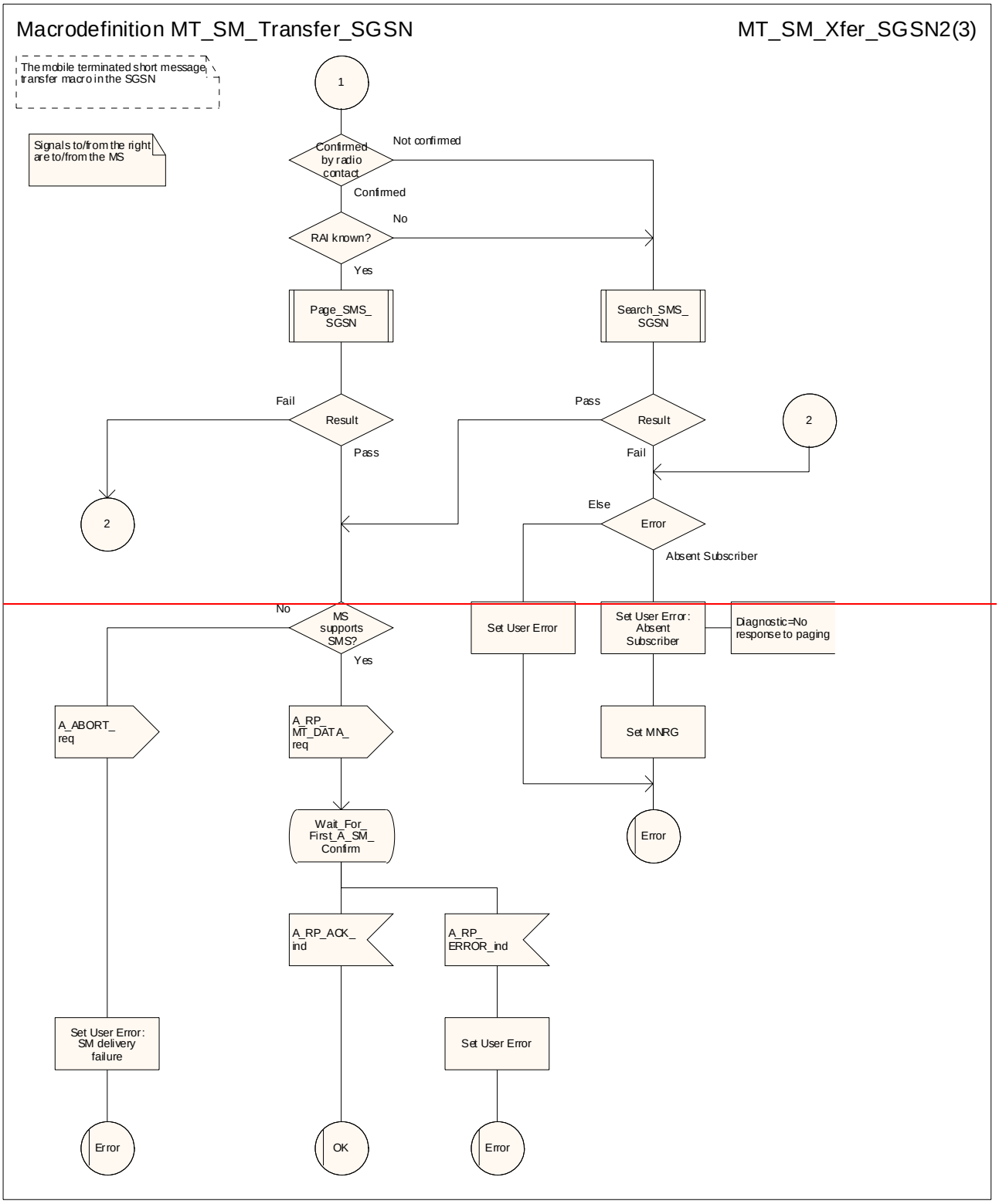


Figure ~~23.3/10~~23.3/11 (sheet 1 of 3): Macro MT_SM_TRANSFER_SGSN


Macrodefinition MT_SM_Transfer_SGSN
MT_SM_Xfer_SGSN2(3)
The mobile terminated short message transfer macro in the SGSN
Signals to/from the right are to/from the MS
1
Confirmed by radio contact
Not confirmed
Confirmed
RAI known?
No
Yes
Page_SMS_ SGSN
Search_SMS_ SGSN
Fail
Result
Pass
Pass
Result
Fail
2
2
Else
Error
Absent Subscriber
No
MS supports SMS?
Yes
Set User Error
Set User Error: Absent Subscriber
Diagnostic=No response to paging
A_ABORT_ req
A_RP_ MT_DATA_ req
Set MNRG
Wait_For_ First_A_SM_ Confirm
Error
A_RP_ACK_ ind
A_RP_ ERROR_ind
Set User Error: SM delivery failure
Set User Error
Error
OK
Error

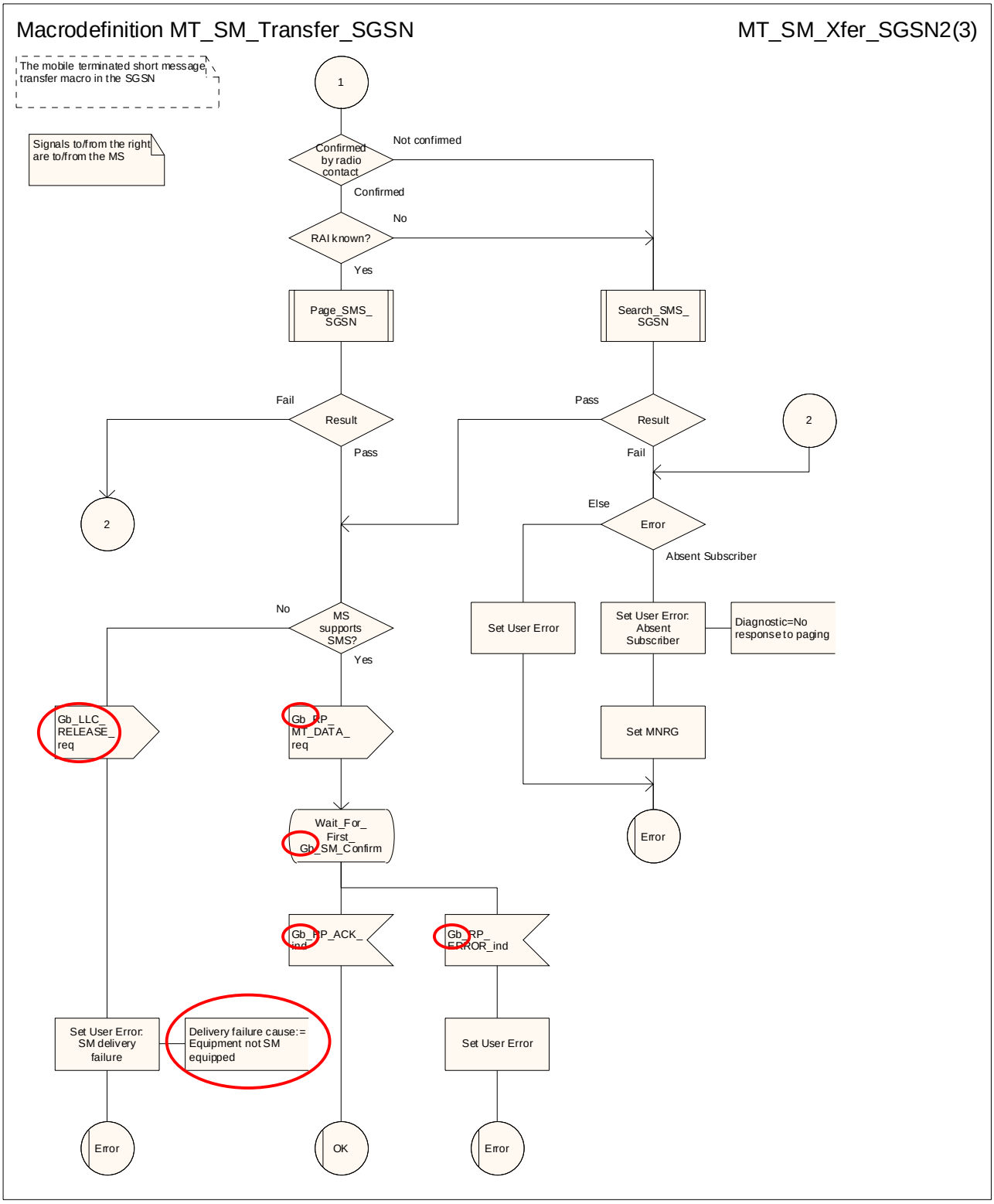
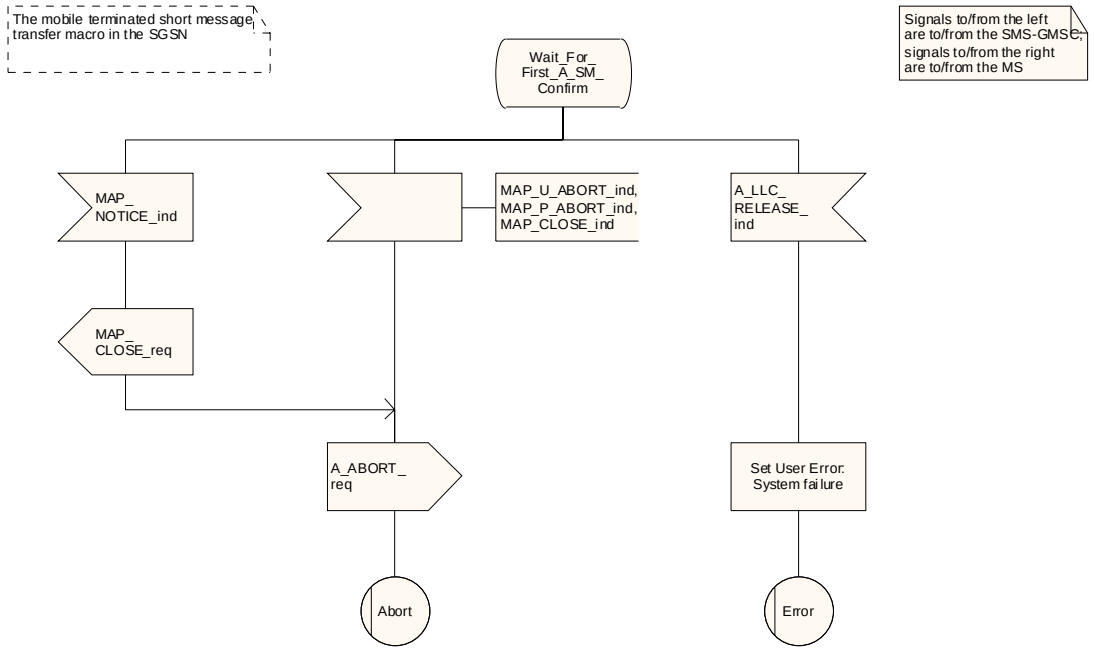


Figure ~~23.3/10~~23.3/11 (sheet 2 of 3): Macro MT_SM_TRANSFER_SGSN

Macrodefinition MT_SM_Transfer_SGSN MT_SM_Xfer_SGSN3(3)



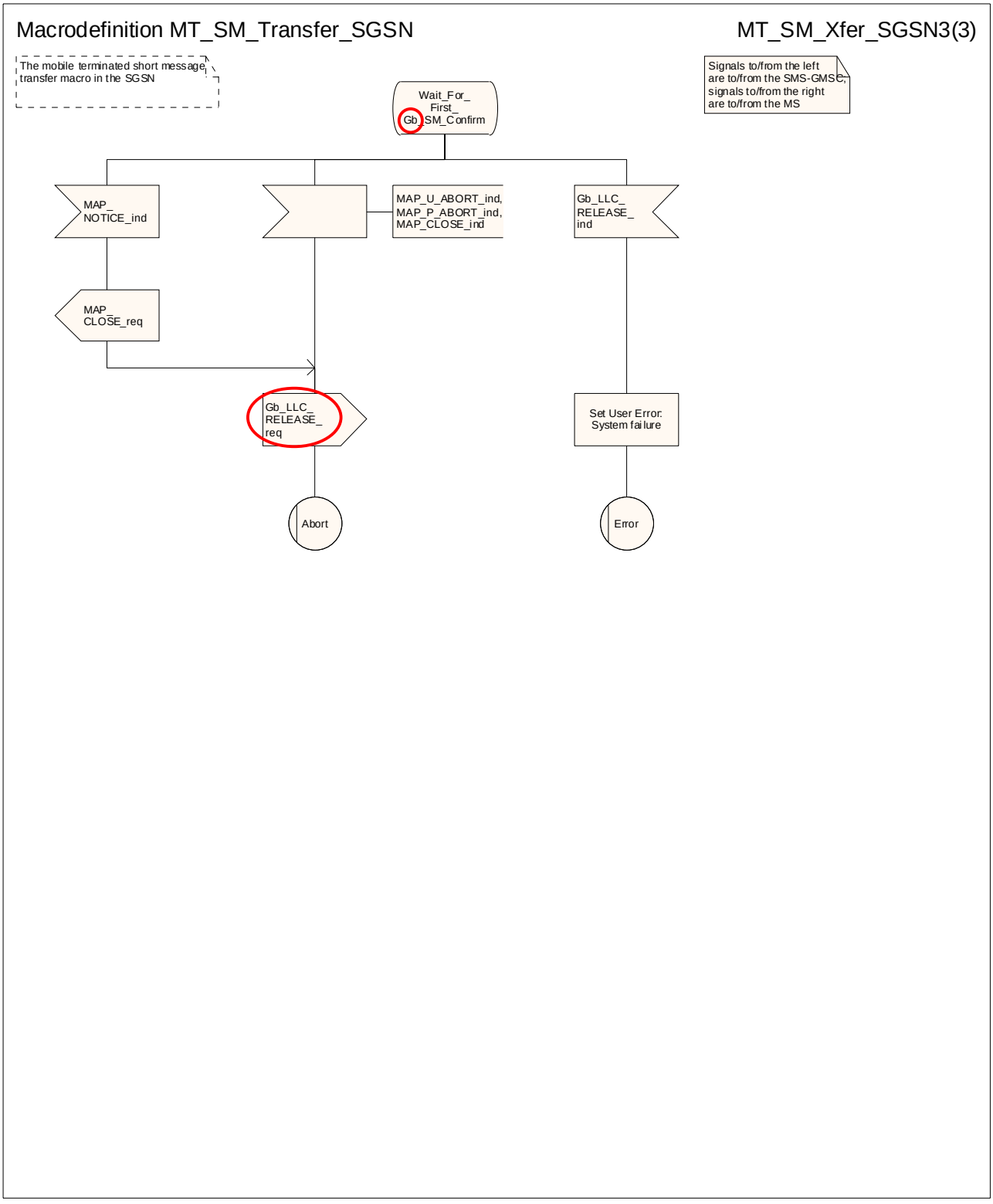
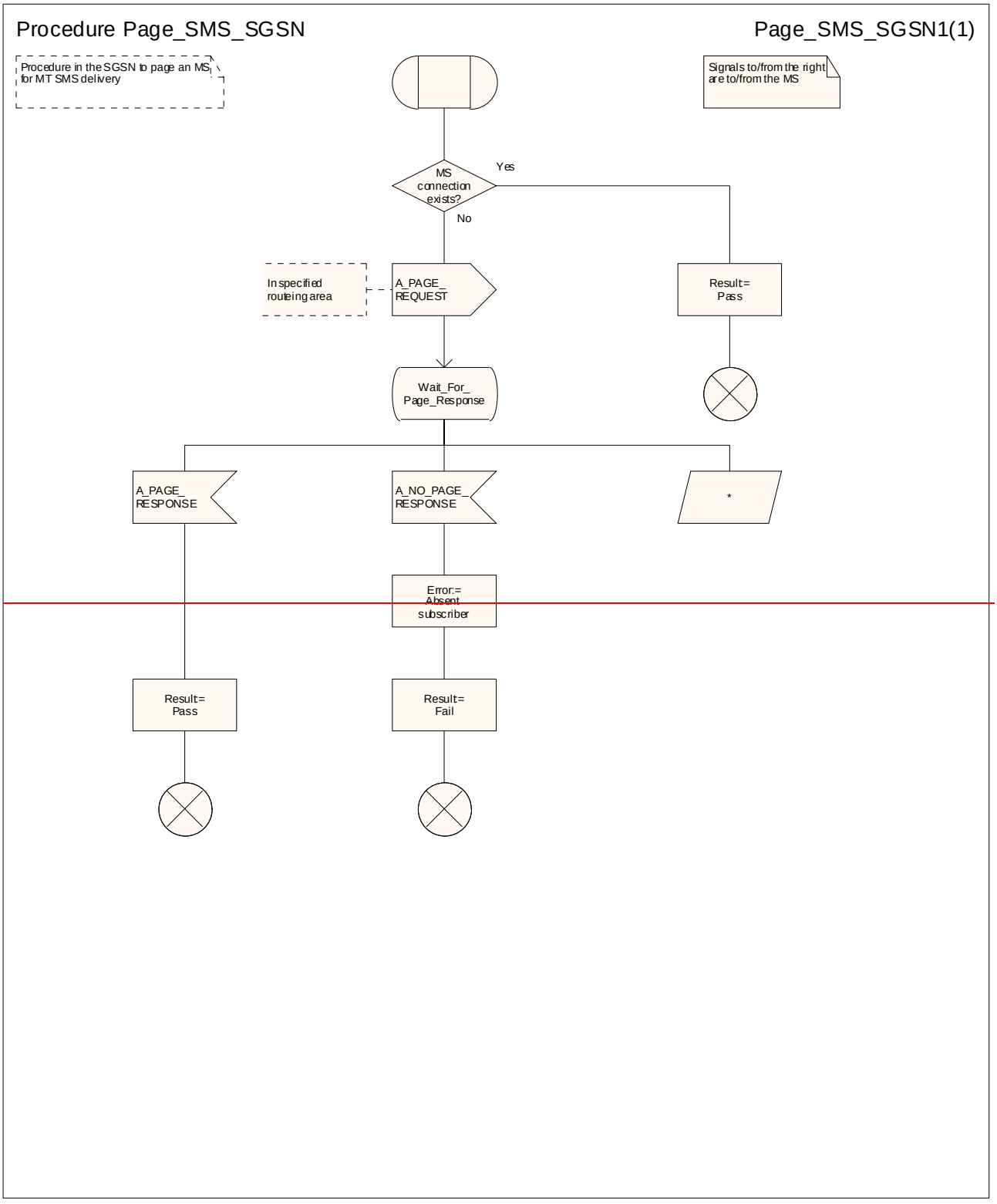


Figure ~~23.3/10~~23.3/11 (sheet 3 of 3): Macro MT_SM_TRANSFER_SGSN


Procedure Page_SMS_SGSN
Page_SMS_SGSN1(1)
Procedure in the SGSN to page an MS for MT SMS delivery
Signals to/from the right are to/from the MS
MS connection exists?
Yes
No
In specified routeing area
A_PAGE_ REQUEST
Result= Pass
Wait_For_ Page_Response
A_PAGE_ RESPONSE
A_NO_PAGE_ RESPONSE
*
Error:= Absent subscriber
Result= Pass
Result= Fail

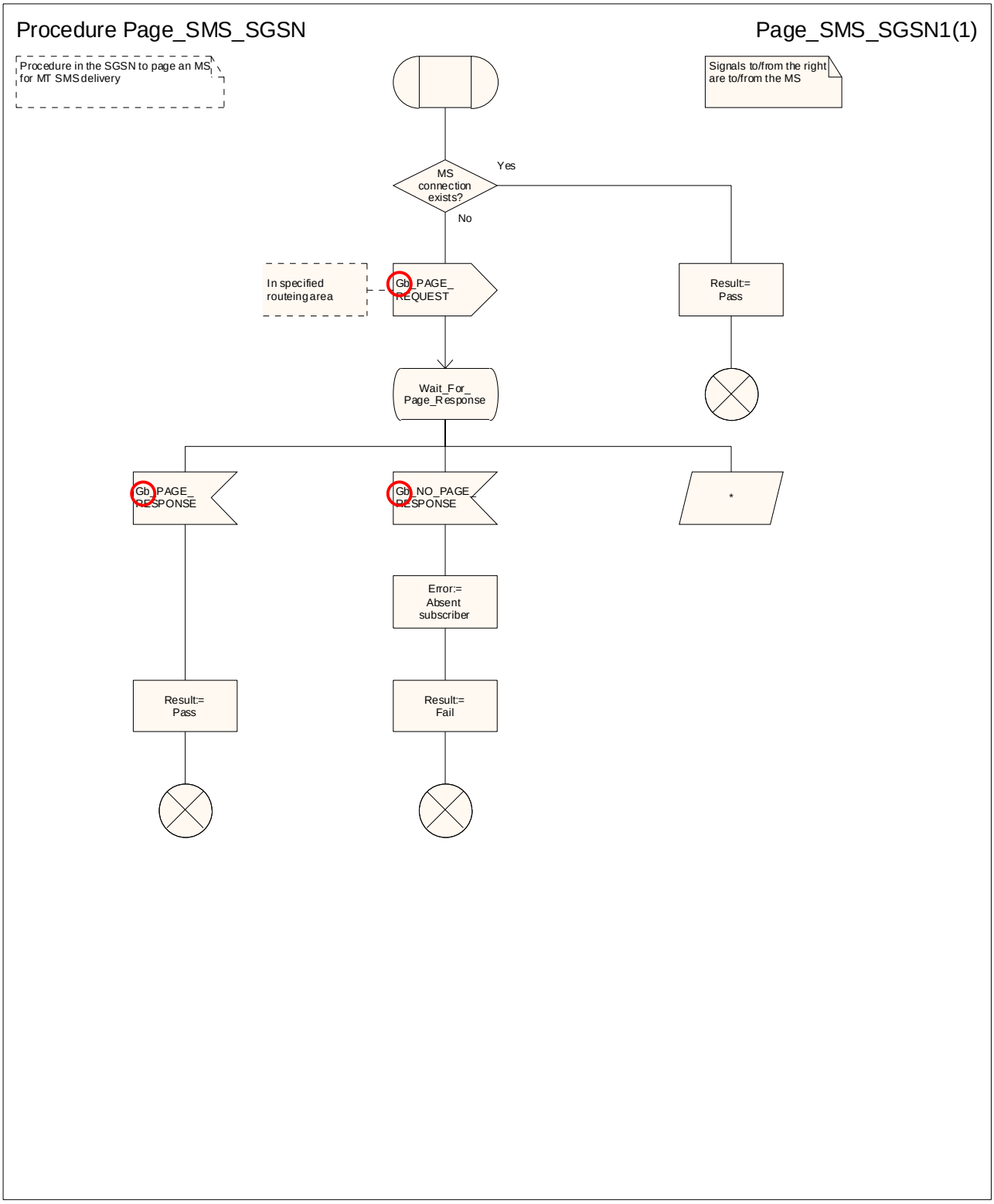
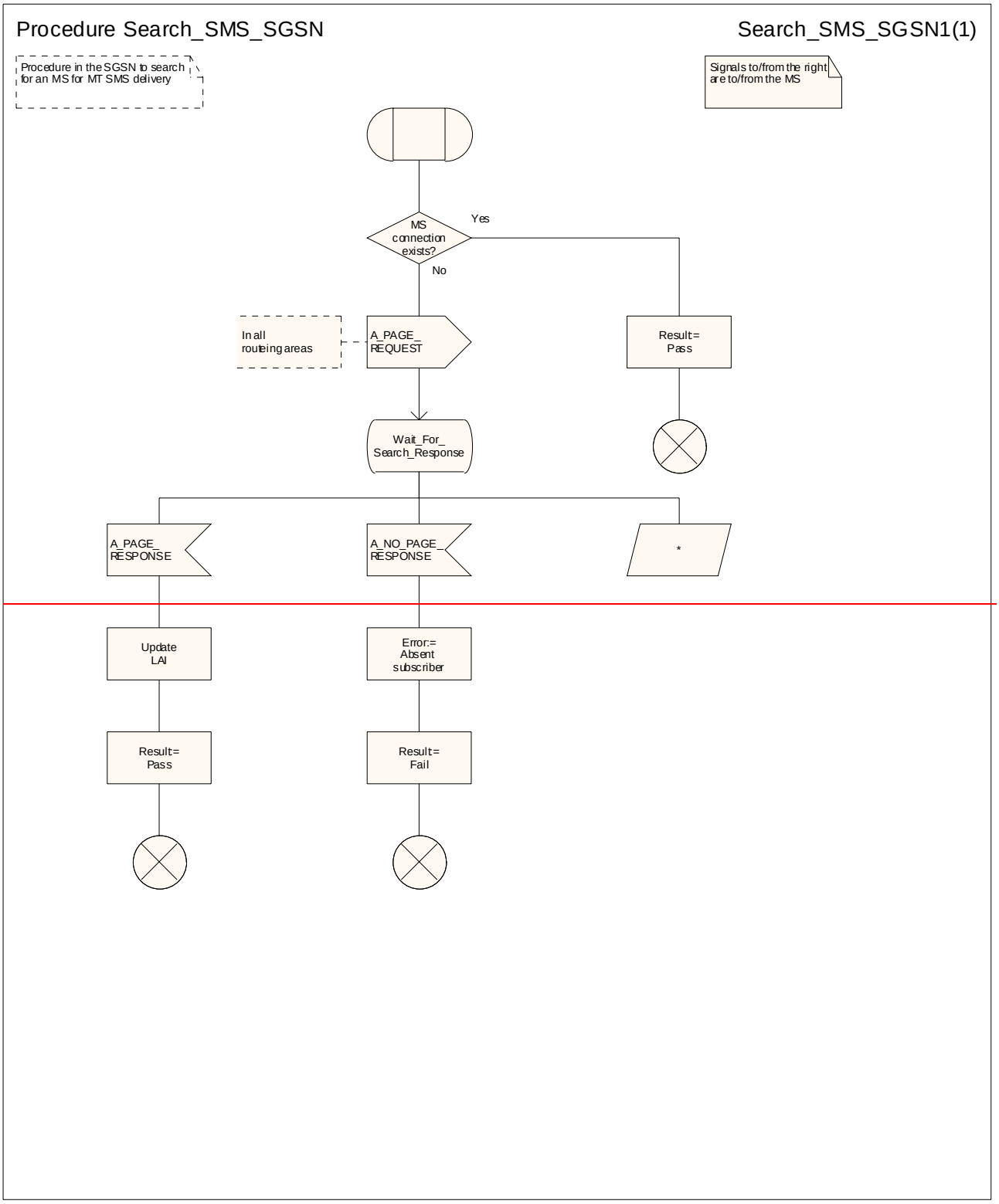


Figure ~~23.3/10a~~23.3/12 (sheet 1 of 1): Procedure Page_SMS_SGSN


Procedure Search_SMS_SGSN
Search_SMS_SGSN1(1)
Procedure in the SGSN to search for an MS for MT SMS delivery
Signals to/from the right are to/from the MS
MS connection exists?
Yes
No
In all routeing areas
A_PAGE_ REQUEST
Result= Pass
Wait_For_ Search_Response
A_PAGE_ RESPONSE
A_NO_PAGE_ RESPONSE
*
Update LAI
Error:= Absent subscriber
Result= Pass
Result= Fail

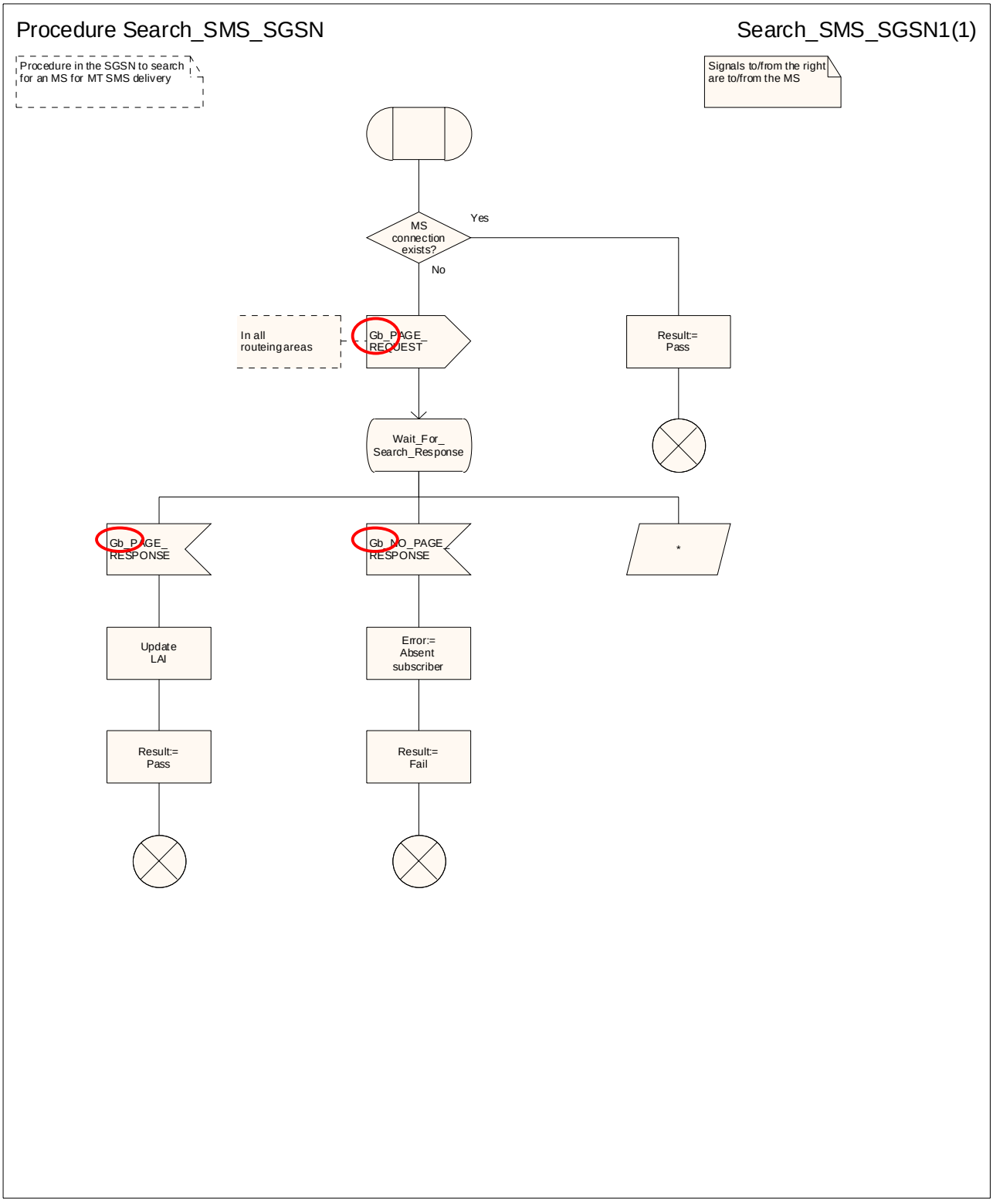
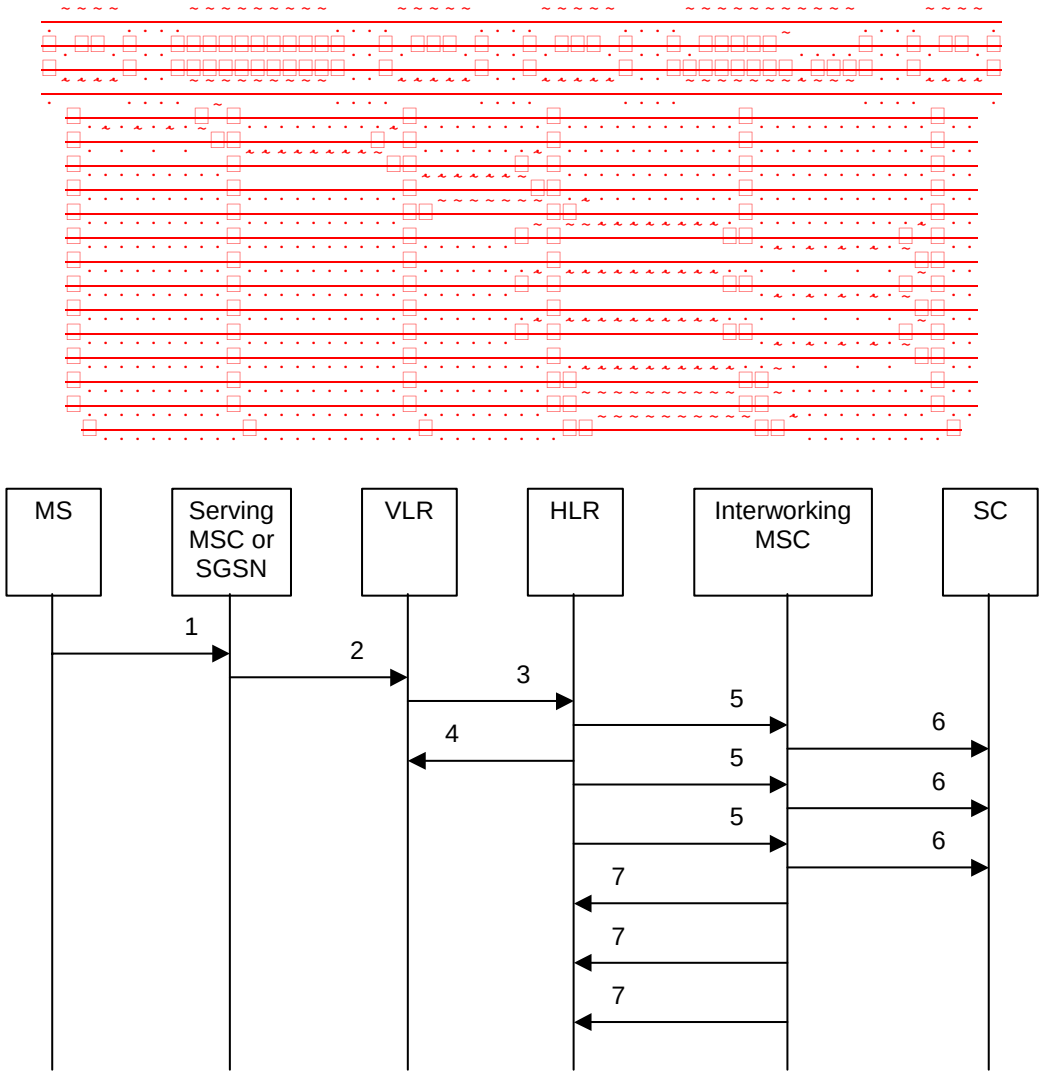


Figure ~~23.3/10b~~23.3/13 (sheet 1 of 1): Procedure Search_SMS_SGSN

23.4 The Short Message Alert procedure

The Short Message Alert procedure is used ~~for~~ to alert~~ing~~ the Service Centre when the mobile subscriber is active after a short message transfer has failed because the mobile subscriber is not reachable, or when the MS has indicated that it has memory capacity to accept a short message.

The message flow for the Short Message Alert procedure for the case when the mobile subscriber was not reachable is shown in figure 23.4/1.



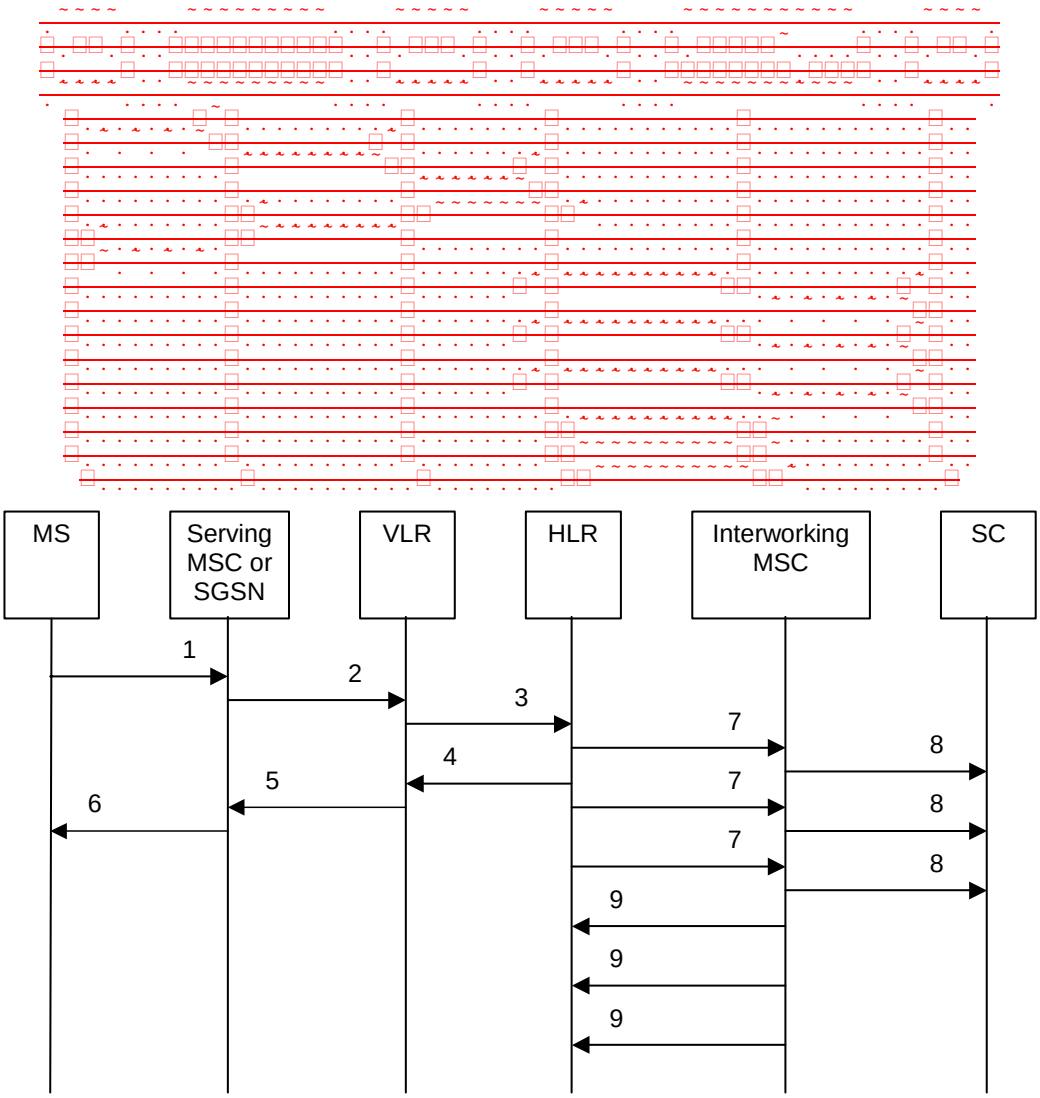
1) CM Service Request (**), Page response or Location Updating (3GPP TS 24.008 [35]).
2) MAP_PROCESS_ACCESS_REQUEST / MAP_UPDATE_LOCATION_AREA (**).
3) MAP_READY_FOR_SM (Mobile Present) / MAP_UPDATE_LOCATION / Supplementary Service Control Request (*).
4) MAP_READY_FOR_SM_ACK (*).
5) MAP_ALERT_SERVICE_CENTRE (notes 1 and 2).
6) Alert Service Centre (3GPP TS 23.140).
7) MAP_ALERT_SERVICE_CENTRE_ACK.

NOTE 1: To all Service Centres in the Message Waiting List.
NOTE 2: The HLR initiates the MAP_ALERT_SERVICE_CENTRE service only if the MS Memory Capacity Exceeded flag is clear.

(*) ~~In case of~~For GPRS, messages 3) and 4) are sent/received by the SGSN.
(**) Those messages are not used by the SGSN.

Figure 23.4/1: Short message alert procedure (Mobile is present)

The message flow for the Short Message Alert procedure for the case where the MS indicates that it has memory capacity to accept one or more short messages is shown in figure 23.4/2.



1) SM memory capacity available (3GPP TS 24.011 [37]).
2) MAP_READY_FOR_SM (Memory Available) (*).
3) MAP_READY_FOR_SM (Memory Available) (**).
4) MAP_READY_FOR_SM_ACK (**).
5) MAP_READY_FOR_SM_ACK (*).
6) SM memory capacity available (Acknowledge) (3GPP TS 24.011 [37]).
7) MAP_ALERT_SERVICE_CENTRE (note).
8) Alert Service Centre (3GPP TS 23.140).
9) MAP_ALERT_SERVICE_CENTRE_ACK.

NOTE: To all Service Centres in the Message Waiting List.
(*) Message 2) and 5) are not used by the SGSN.
(**) ~~In the case of~~For GPRS, messages 3) and 4) are sent/received by the SGSN.

Figure 23.4/2: Short message alert procedure (MS memory capacity available)

In addition the following MAP services are used in the MS memory available case:

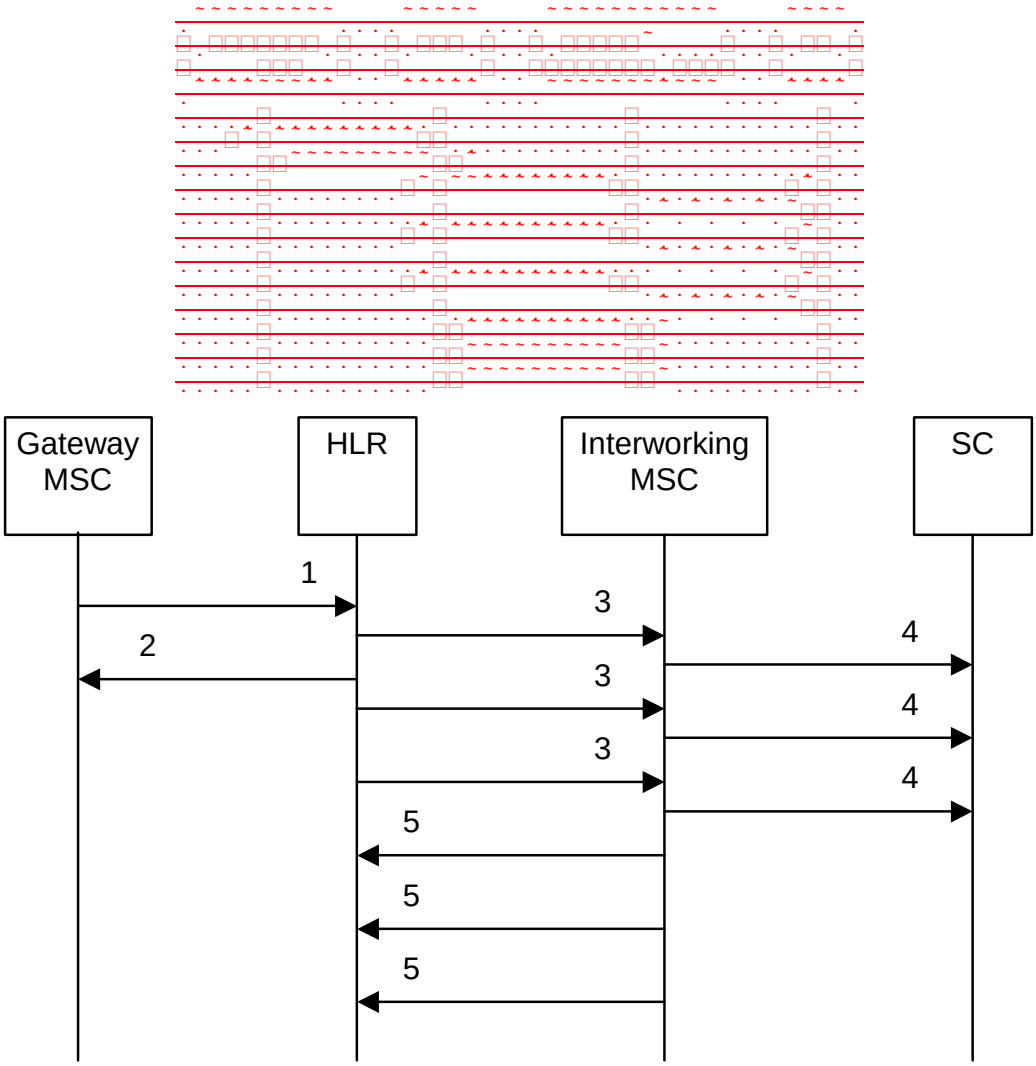
MAP_PROCESS_ACCESS_REQUEST	(see subclause 8.3); (*)
MAP_AUTHENTICATE	(see subclause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see subclause 8.6); (*)
MAP_PROVIDE_IMSI	(see subclause 8.9); (*)
MAP_CHECK_IMEI	(see subclause 8.7);

MAP_FORWARD_NEW_TMSI (see subclause 8.9); (*)

MAP_TRACE_SUBSCRIBER_ACTIVITY (see subclause 9.1). (*)

(*) Those messages are not used by the SGSN.

The Short Message Alert procedure when the MS indicates successful transfer after polling is shown in figure 23.4/3.



1) MAP_REPORT_SM_DELIVERY_STATUS (Successful Transfer).
2) MAP_REPORT_SM_DELIVERY_STATUS_ACK.
3) MAP_ALERT_SERVICE_CENTRE (note).
4) Alert Service Centre (3GPP TS 23.140).
5) MAP_ALERT_SERVICE_CENTRE_ACK.

NOTE: To all Service Centres in the Message Waiting List.

Figure 23.4/3: Short message alert procedure (Successful transfer after polling)

23.4.1 Procedures in the Servicing MSC – the MS has memory available

~~The activation of the MAP_PROCESS_ACCESS_REQUEST service is described in the clause 23.6.2.~~

~~After~ When the MSC receives~~ing the~~ an SM memory capacity available indication, ~~the servicing MSC~~it sends to the VLR ~~the~~ a MAP_READY_FOR_SM request ~~to the VLR~~ indicating that the MS has memory available, and waits for a response. ~~The outcome of that procedure is one of the following~~While the MSC is waiting for the response from the VLR:

- if the MSC receives a Release indication from the A-interface, it aborts the dialogue with the VLR, and the process terminates;

- if the VLR aborts, or prematurely closes, the dialogue, the MSC sends an A_RP_ERROR with error cause "Network out of order" to the MS, and the process terminates;

- if the ~~VLR~~MSC receives a MAP_READY_FOR_SM confirmation from the VLR, it checks the confirmation.

  - if the confirmation includes an error, the MSC sends an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;

  - if the confirmation indicates a successful outcome, the MSC sends an RP_ACK to the MS, and the process terminates.

~~successful acknowledgement. The MSC sends the corresponding message to the MS;~~

~~negative acknowledgement, where the error causes are treated as follows:~~

~~unexpected data value, data missing and system failure errors are reported as network out of order error to the MS;~~

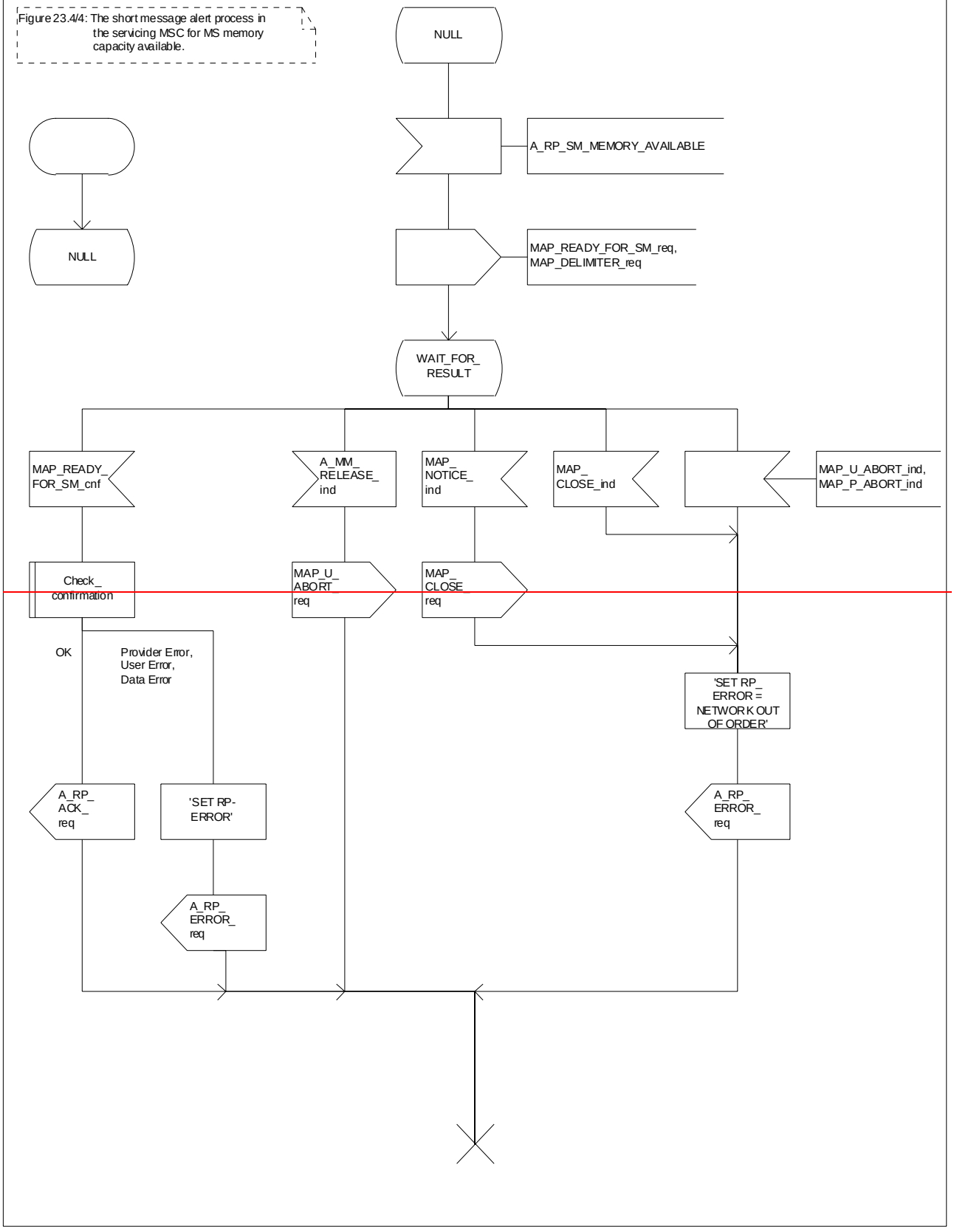
~~facility not supported is reported as requested facility not implemented error to the MS;~~

~~procedure failure, which is reported as network out of order error to the MS if a connection to the MS still exists.~~

The short message alert proces~~sdure~~ in the MSC for the MS memory capacity available case is shown in figure 23.4/4.

Process SM_Alert_MSC 23.4_4(1)

Figure 23.4/4: The short message alert process in the servicing MSC for MS memory capacity available.



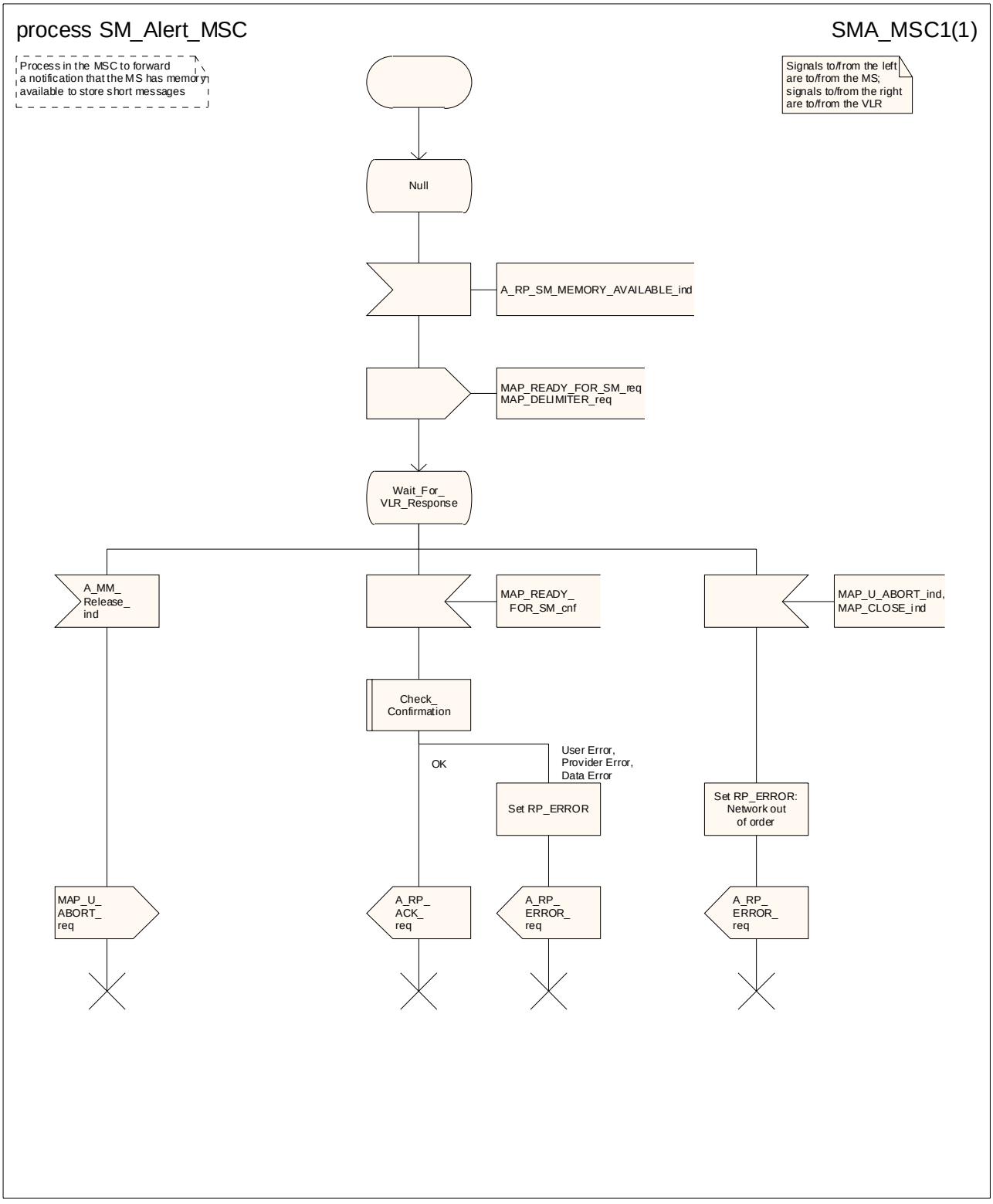


Figure 23.4/4: Procedure SM_Alert_MSC

23.4.2 Procedures in the VLR

23.4.2.1 The Mobile Subscriber is present

~~When receiving the~~If the VLR successfully handles a MAP_PROCESS_ACCESS_REQUEST indication~~,~~ or a MAP_UPDATE_LOCATION_AREA indication while the MS ~~n~~Not ~~r~~Reachable ~~f~~Flag (MNRF) is set, the VLR ~~will~~ send~~s~~ a ~~the~~ MAP_READY_FOR_SM request to~~wards~~ the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for non GPRS. If ~~the~~ authentication ~~procedure is initiated and it~~ fails during the handling of a MAP_PROCESS_ACCESS_REQUEST indication or a MAP_UPDATE_LOCATION_AREA indication, the VLR ~~will~~ shall not send a MAP_READY_FOR_SM request to the HLR~~initiate the service~~. The process in the VLR is described in detail in ~~the~~ subclause 25.10.

23.4.2.2 The ~~Mobile Equipment~~MS has memory available

The process is triggered by a dialogue opening request followed by a MAP_PROCESS_ACCESS_REQUEST indication including a CM service type Short Message Service.

~~starts the MAP_PROCESS_ACCESS_REQUEST service in the VLR. The application context in the MAP_OPEN indication refers to the short message alerting procedure.~~

- ~~I~~if the macro Process_Access_Request_VLR takes the "Error" exit, the process returns to the Null state.~~service MAP_PROCESS_ACCESS_REQUEST is successful, the VLR waits for the next message from the MSC. When receiving the MAP_READY_FOR_SM indication from the MSC, the VLR will check the contents. Data errors are reported to the MSC as an unexpected data value or data missing error, depending on the error. If the primitive passes the data check, the VLR forwards it to the HLR and awaits an acknowledgement.~~

- if the macro Process_Access_Request_VLR takes the "OK" exit, the VLR waits for a MAP_READY_FOR_SM indication from the MSC.

When the VLR receives a MAP_READY_FOR_SM indication from the MSC, it checks the indication.

- if the indication is badly formed, the VLR returns a MAP_READY_FOR_SM response containing the appropriate User Error;

- if the indication is OK, the VLR requests a dialogue with the HLR, including a MAP_READY_FOR_SM request with Ready for SM reason Memory available for non-GPRS, and waits for the confirmation of the dialogue.

  - if the macro Receive_Open_Cnf takes the "Error" exit, the VLR returns a MAP_READY_FOR_SM response containing a User Error "System failure", and the process returns to the Null state;

  - if the macro Receive_Open_Cnf takes the "V1" exit, the VLR returns a MAP_READY_FOR_SM response containing a User Error "Facility not supported", and the process returns to the Null state;

  - if the macro Receive_Open_Cnf takes the "Vr" (for a version higher than 1) exit, the VLR handles the dialogue according to the specification for the earlier version of the protocol, and the process returns to the Null state;

  - if the macro Receive_Open_Cnf takes the "OK" exit, the VLR waits for a response from the HLR.

When the VLR is waiting for a response from the HLR:

- if the dialogue with the HLR fails, the VLR returns a MAP_READY_FOR_SM response containing a User Error "System failure", and the process returns to the Null state;

- if it receives a MAP_READY_FOR_SM confirmation, it checks the confirmation.

  - if the confirmation contains an error, the VLR returns a MAP_READY_FOR_SM response containing the appropriate User Error , and the process returns to the Null state;

  - if the confirmation indicates success, the VLR returns a MAP_READY_FOR_SM response indicating success, and the process returns to the Null state.

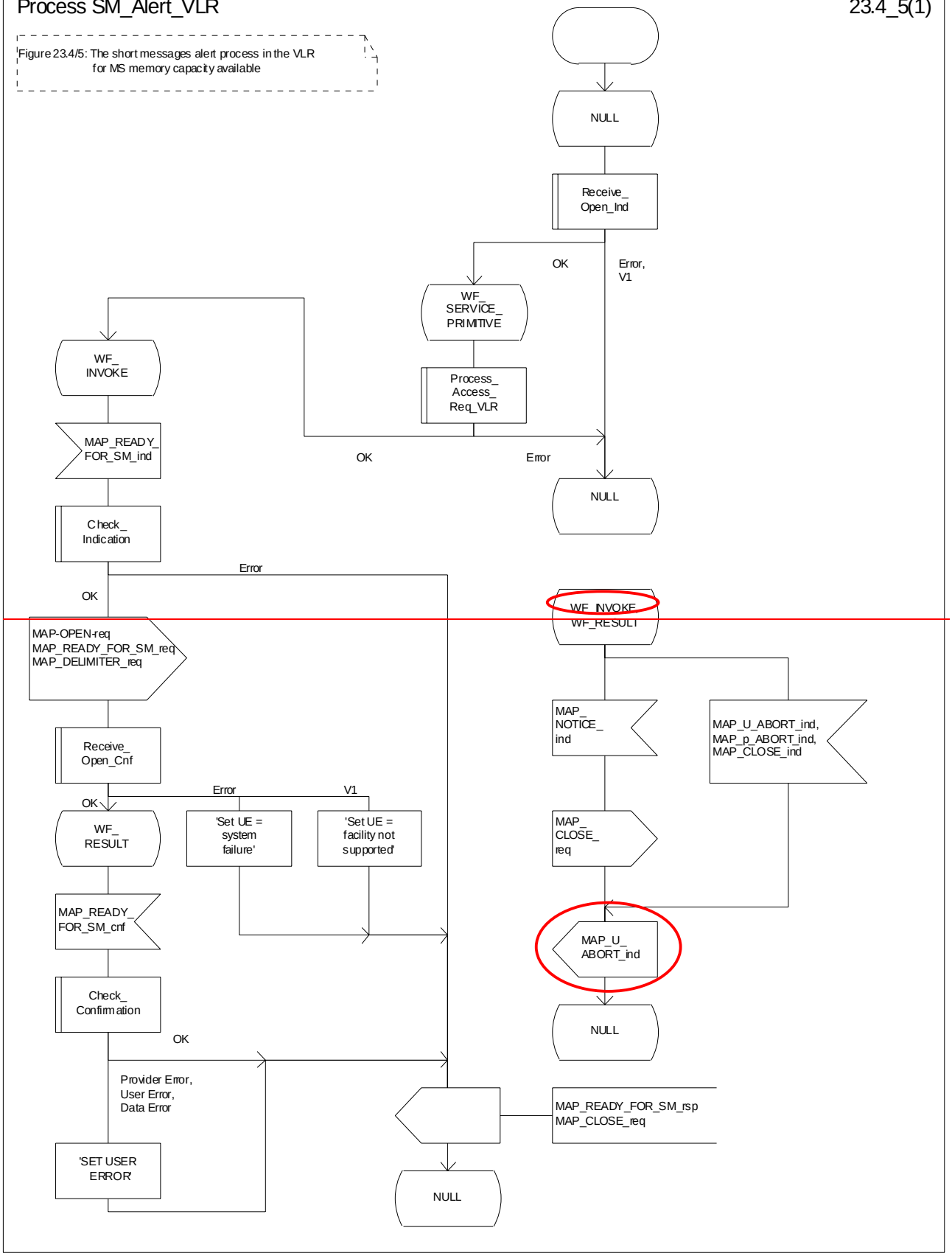
~~When receiving the MAP_READY_FOR_SM confirmation from the HLR and the Alert Reason is MS memory available, the VLR will act as follows:~~

- ~~the MAP_READY_FOR_SM response is sent to the MSC as follows:~~
  - ~~an acknowledgement in the positive case;~~
  - ~~system failure error, if unexpected data value, data missing, or unknown subscriber errors are received, otherwise the error cause received from the HLR;~~
  - ~~a facility not supported error, if the HLR supports MAP Vr only;~~
  - ~~procedure failure is reported as a system failure error.~~

The short message alert proces[s]~~dure~~ in the VLR is shown in figure~~s~~ 23.4/5.

Process SM_Alert_VLR 23.4_5(1)

Figure 23.4/5: The short messages alert process in the VLR for MS memory capacity available



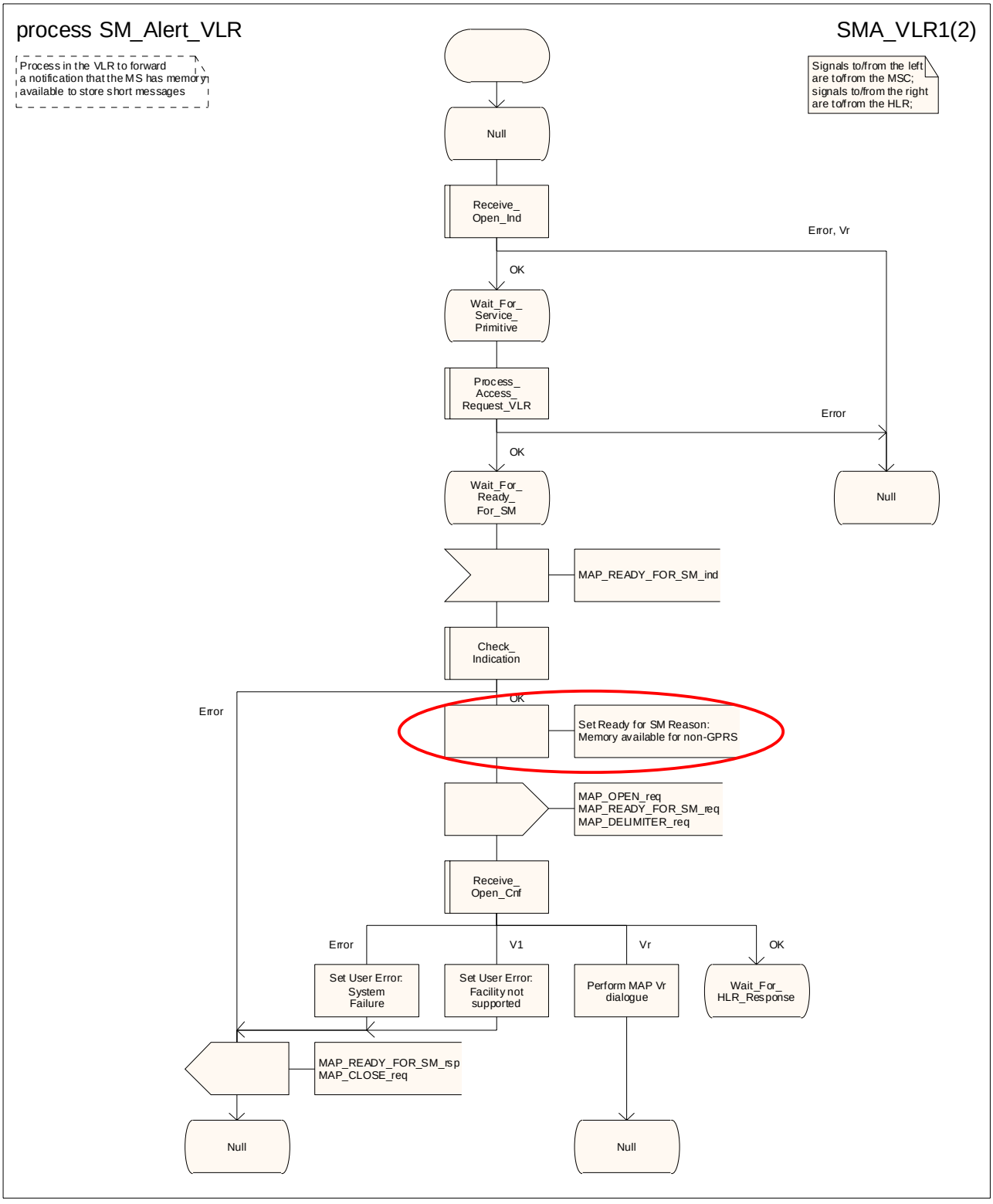


Figure 23.4/5 (sheet 1 of 2): Procedure SM_Alert_VLR

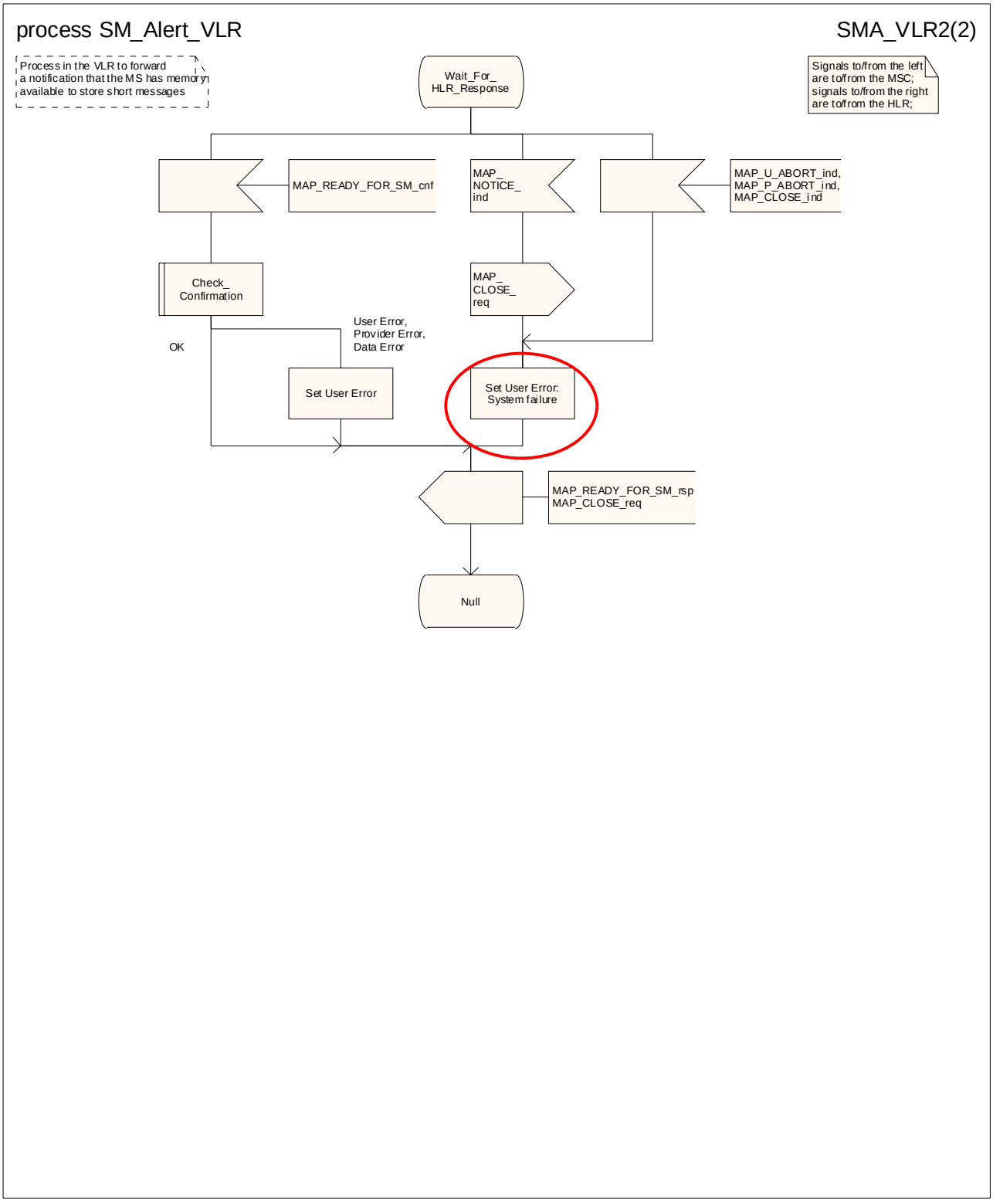


Figure 23.4/5 (sheet 2 of 2): Procedure SM_Alert_VLR

23.4.3 Procedures in the HLR

The process is triggered by a dialogue opening request using the application context mwdMngtContext.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the HLR handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

NOTE: if the dialogue opening request is from an SGSN, version 2 and version 1 of the application context are not applicable.

- if the macro Receive_Open_Ind takes the "OK" exit, the HLR waits for a service primitive.

While the HLR is waiting for the service primitive:

- if the dialogue fails, the process returns to the Null state;
- if it receives a MAP_READY_FOR_SM indication, it checks the indication.
  - if the indication is badly formed, the HLR returns a MAP_READY_FOR_SM response containing the appropriate user error, and the process returns to the Null state;
  - if the indication is OK, the HLR checks whether it supports:
    - one or both of MNRF and MNRG, and
    - MCEF and
    - MWD.
      - if the HLR does not support the message waiting features listed, it returns a MAP_READY_FOR_SM response containing the user error "Facility not supported", and the process returns to the Null state;
      - if the HLR supports the message waiting features listed, but the subscriber is not known, it returns a MAP_READY_FOR_SM response containing the user error "Unknown subscriber", and the process returns to the Null state;
      - if the subscriber is known, the HLR returns a MAP_READY_FOR_SM response indicating a successful result, and checks whether one or more of MNRF, MNRG and MCEF is set.
        - if none of MNRF, MNRG and MCEF is set, the HLR starts a race timer and waits for a possible delivery failure report. This allows for the race condition where a delivery failure report is delayed in the path through the SMS-GMSC, and is overtaken by a subsequent "ready for SM" condition reported by the serving node to the HLR;
        - if one or more of MNRF, MNRG and MCEF is set, the HLR continues by handling the alerting process as described below under the heading "Alerting the Service Centre(s)".
- if it receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it invokes the macro Report_SM_Delivery_Stat_HLR.
  - if the macro takes the "Error" exit, the HLR waits for a possible MAP_READY_FOR_SM indication;
  - if the macro takes the "OK" exit, the HLR checks whether the delivery was successful.
    - if the delivery was unsuccessful, the HLR waits for a possible MAP_READY_FOR_SM indication;
    - if the delivery was successful, the HLR stops the Race timer, and the process returns to the Null state.

When the HLR is waiting for a possible MAP_READY_FOR_SM indication or MAP_REPORT_SM_DELIVERY_STATUS indication with the race timer running:

- if the race timer expires, the process returns to the Null state;
- if the HLR receives a dialogue opening request, it invokes the macro Receive_Open_Ind.

- if the macro takes the "Error" exit, the process returns to the Null state;
- if the macro takes the "Vr" exit, the HLR handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the HLR waits for a service primitive.

Alerting the Service Centre(s)

The HLR checks the Ready for SM reason which was received from the serving node.

- if the reason was "Memory available for GPRS", the HLR clears the MNRG flag and the MCEF and invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
- if the reason was "Subscriber present for GPRS", the HLR clears the MNRG flag and checks the MCEF.
  - if the MCEF is not set, the HLR invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
  - if the MCEF is set, the process returns to the Null state;
- if the reason was "Memory available for non-GPRS", the HLR clears the MNRF and the MCEF and invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
- if the reason was "Subscriber present for non-GPRS", the HLR clears the MNRF and checks the MCEF.
  - if the MCEF is not set, the HLR invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
  - if the MCEF is set, the process returns to the Null state.

~~When receiving the MAP_READY_FOR_SM indication, the HLR will check the contents. Data errors are reported to the VLR as an unexpected data value or a data missing error depending on the error. If the HLR does not support the MNRF or MNRG, MCEF, and MWD a facility not supported error is reported to the VLR or SGSN. If the IMSI is unknown an unknown subscriber error is reported to the VLR or SGSN. Otherwise an acknowledgement is returned to the VLR or SGSN.~~

~~If neither the MS not reachable flag (MNRF) or the MS not reachable for GPRS (MNRG) flag, nor the memory capacity exceeded flag (MCEF) are set, and MAP_READY_FOR_SM is received from the VLR or SGSN, the HLR sets a timer and waits for it to expire. This ensures that in the race situation the MAP_REPORT_SM_DELIVERY_STATUS service (as described in the clause 23.6) for the same subscriber can be carried out when delayed in the GMSC.~~

~~If the Alert Reason indicates the mobile present for non GPRS situation, or when the update location procedure has been successfully completed or Supplementary Service Control request is received, the MS not reachable flag (MNRF) is cleared and the service centre alert procedure is initiated. If the memory capacity exceeded flag is set, the MS not reachable flag is cleared and stored reason for absence for non GPRS are cleared but the alert procedure is not started.~~

~~If the Alert Reason indicates the mobile present for GPRS situation, or when the Update GPRS location procedure has been successfully completed, the MS not reachable for GPRS (MNRG) flag is cleared and the service centre alert procedure is initiated. If the memory capacity exceeded flag is set, the MS detach for GPRS flag is cleared and stored reason for absence for GPRS are cleared but the alert procedure is not started.~~

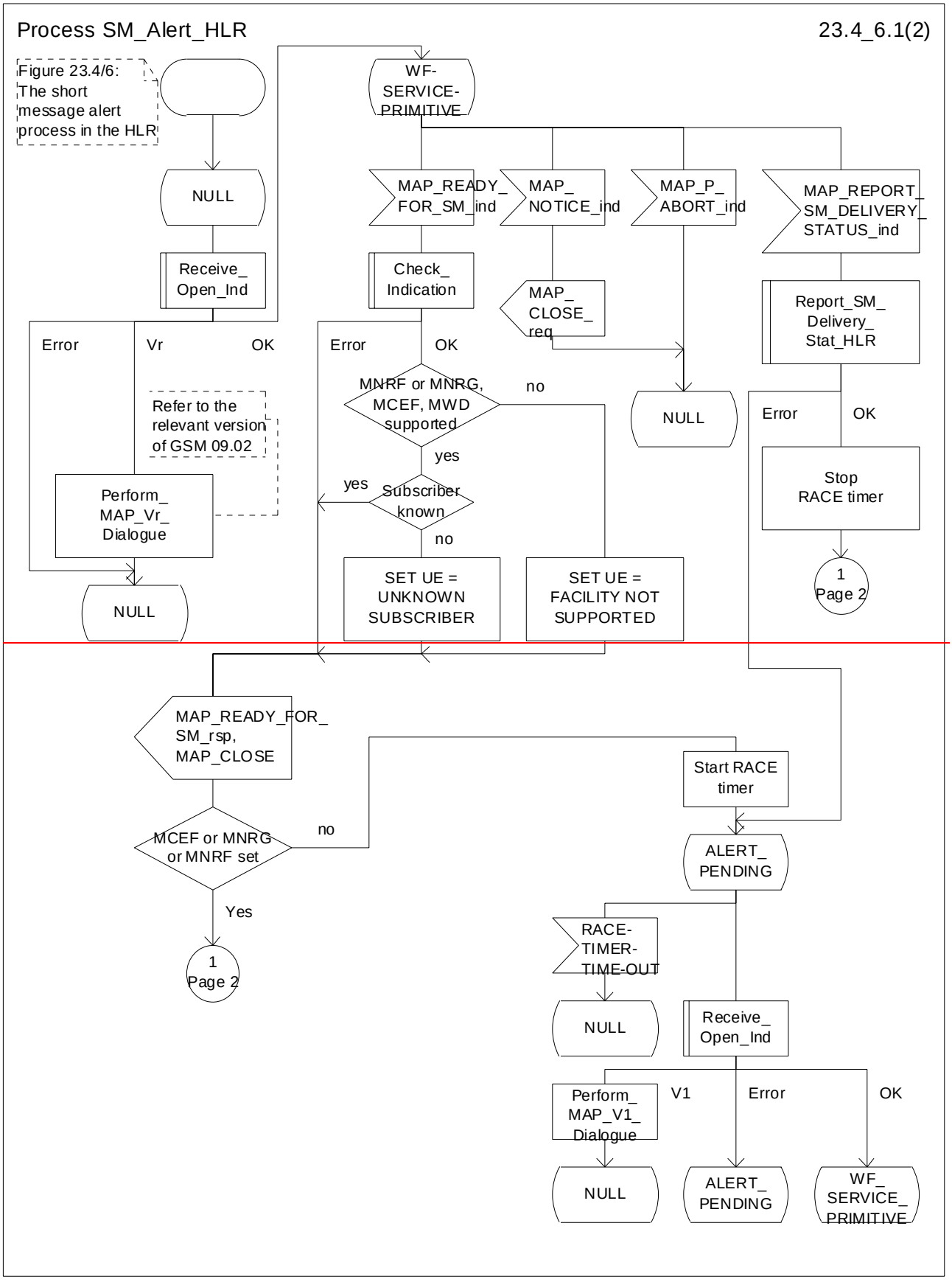
~~If the Alert Reason indicates the memory available for non GPRS situation, the HLR initiates the alert procedure. The MS not reachable and memory capacity available flags are cleared.~~

~~If the Alert Reason indicates the memory available for GPRS situation, the HLR initiates the alert procedure. The MS detach for GPRS and memory capacity available flags are cleared.~~

~~If the MAP_REPORT_SM_DELIVERY_STATUS indication is received and it indicates the successful transfer of the mobile terminated short message for non GPRS, the HLR initiates the alert procedure described in the clause 25.10 and clears MCEF and MNRF flags and stored reason for absence for non GPRS are cleared.~~

~~If the MAP_REPORT_SM_DELIVERY_STATUS indication is received and it indicates the successful transfer of the mobile terminated short message for GPRS, the HLR initiates the alert procedure described in the clause 25.10 and clears MCEF and MNRG flags and stored reason for absence for GPRS are cleared.~~

The short message alert processdure in the HLR is shown in figures 23.4/6 and 25.10/2.


Process SM_Alert_HLR
23.4_6.1(2)
Figure 23.4/6: The short message alert process in the HLR
NULL
Receive_ Open_Ind
Error
Vr
OK
Refer to the relevant version of GSM 09.02
Perform_ MAP_Vr_ Dialogue
NULL
WF- SERVICE- PRIMITIVE
MAP_READY_ FOR_SM_ind
MAP_ NOTICE_ind
MAP_P_ ABORT_ind
MAP_REPORT_ SM_DELIVERY_ STATUS_ind
Check_ Indication
MAP_ CLOSE_ req
Error
OK
MNRF or MNRG, MCEF, MWD supported
no
yes
yes
Subscriber known
no
SET UE = UNKNOWN SUBSCRIBER
SET UE = FACILITY NOT SUPPORTED
NULL
Report_SM_ Delivery_ Stat_HLR
Error
OK
Stop RACE timer
1 Page 2
MAP_READY_FOR_ SM_rsp, MAP_CLOSE
MCEF or MNRG or MNRF set
no
Yes
1 Page 2
Start RACE timer
ALERT_ PENDING
RACE- TIMER- TIME-OUT
NULL
Receive_ Open_Ind
Perform_ MAP_V1_ Dialogue
V1
Error
OK
NULL
ALERT_ PENDING
WF_ SERVICE_ PRIMITIVE

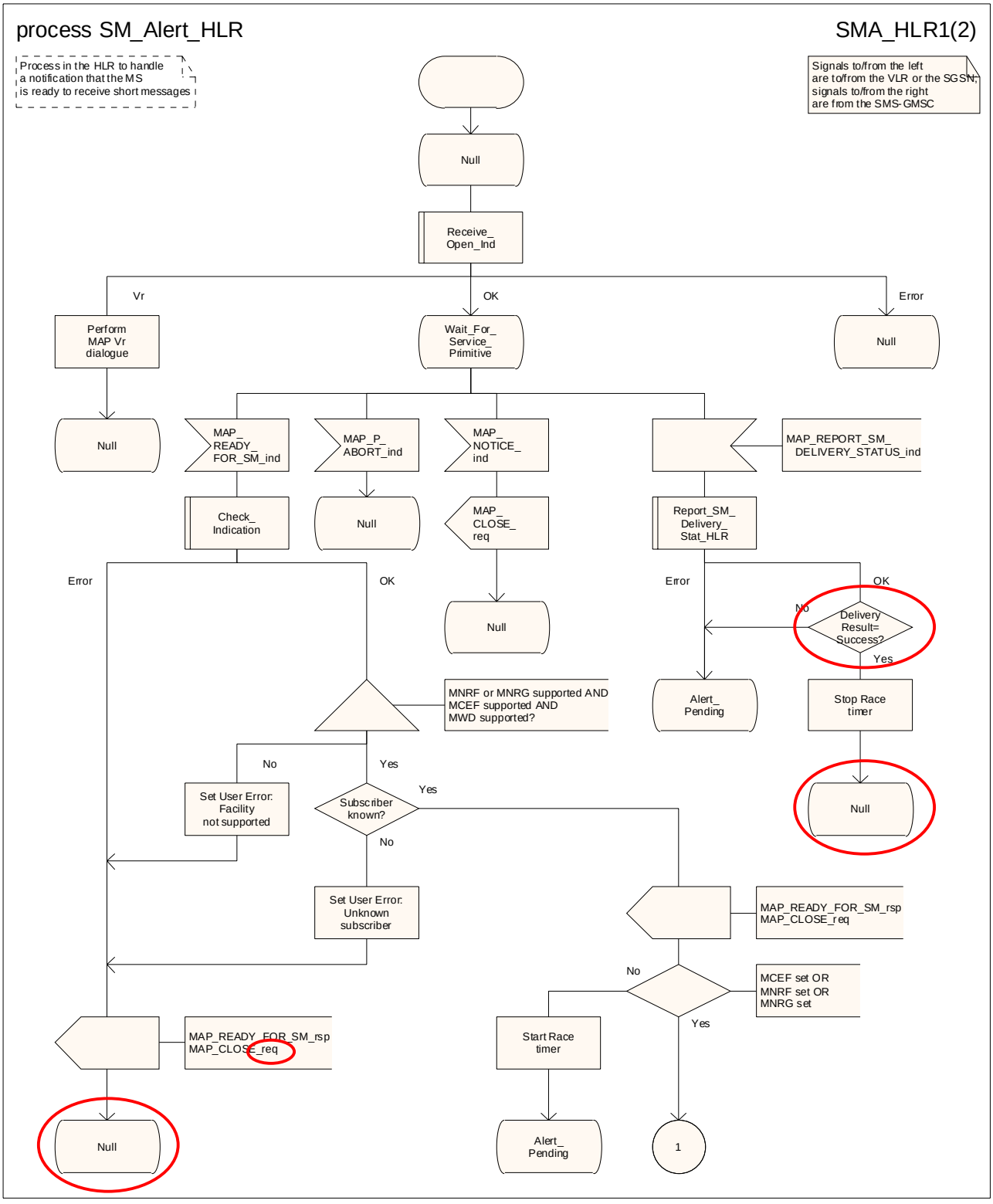
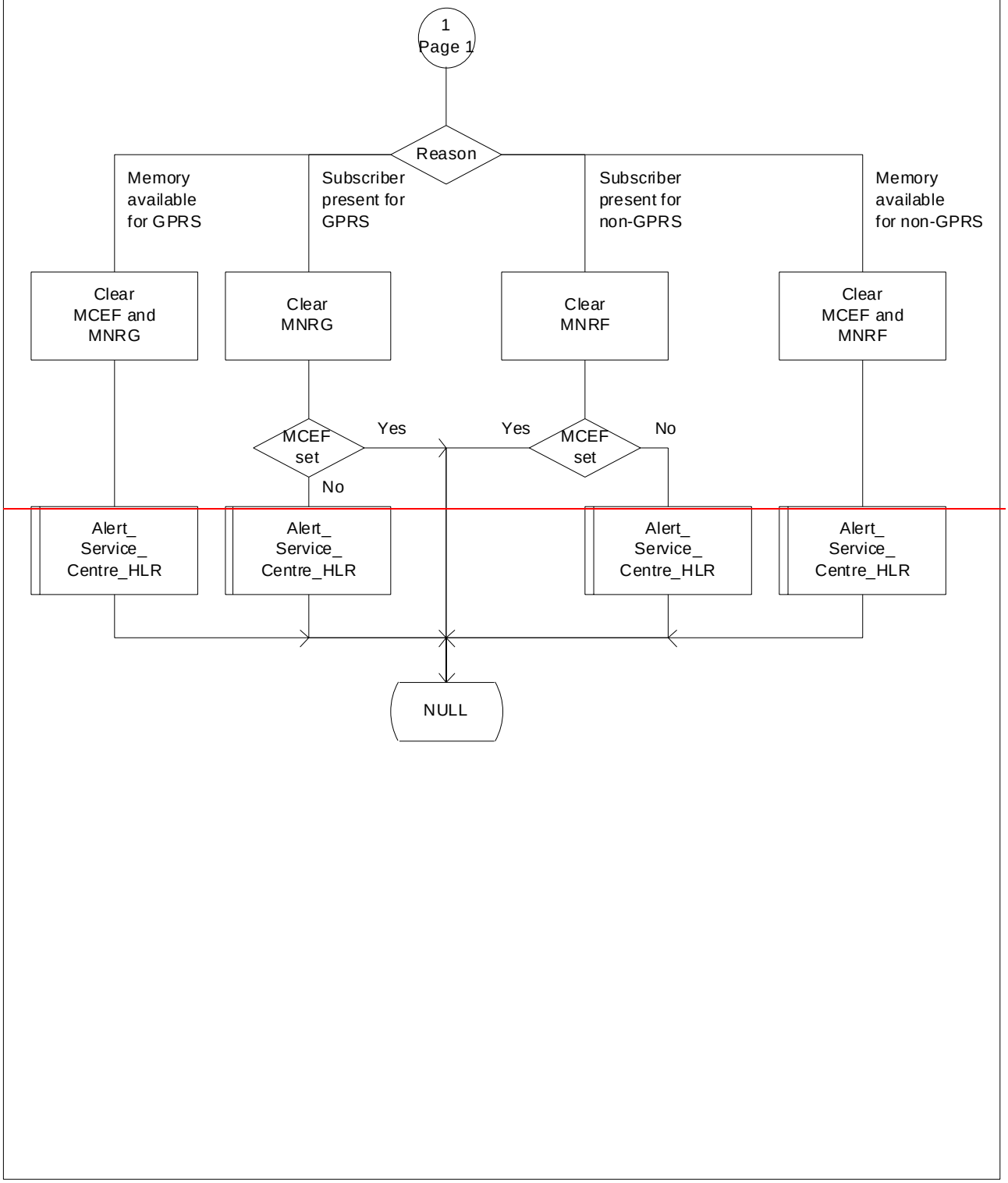


Figure 23.4/6 (sheet 1 of 2): Process SM_Alert_HLR

Process SM_Alert_HLR 23.4_6.2(2)

Figure 23.4/6: The short message alert process in the HLR



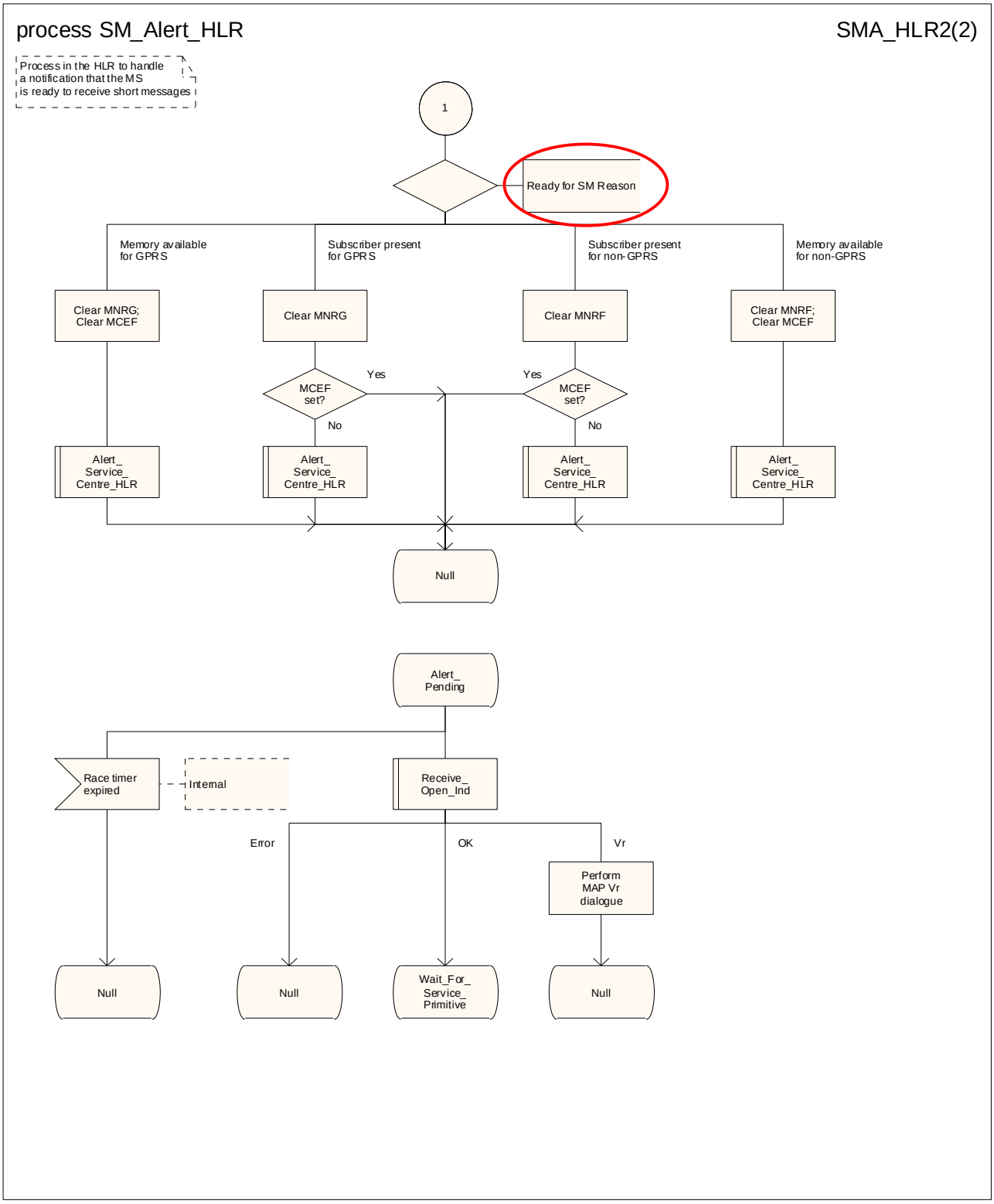


Figure 23.4/6 (sheet 2 of 2): Process SM_Alert_HLR

23.4.4 Procedures in the SMS Interworking MSC

The process is triggered by a dialogue opening request using the application context shortMsgAlertContext.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the SMS-IWMSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the SMS-IWMSC waits for a service primitive.

While the SMS-IWMSC is waiting for the service primitive:

- if the dialogue fails, the process returns to the Null state;
- if it receives a MAP_ALERT_SERVICE_CENTRE indication, it checks the indication.
  - if the indication is badly formed, the SMS-IWMSC returns a MAP_ALERT_SERVICE_CENTRE response containing the appropriate user error, and the process returns to the Null state;
  - if the indication is OK, the SMS-IWMSC sends an SC_RP_ALERT_SC request to the Service Centre and returns a MAP_ALERT_SERVICE_CENTRE response indicating a successful result, and the process returns to the Null state.

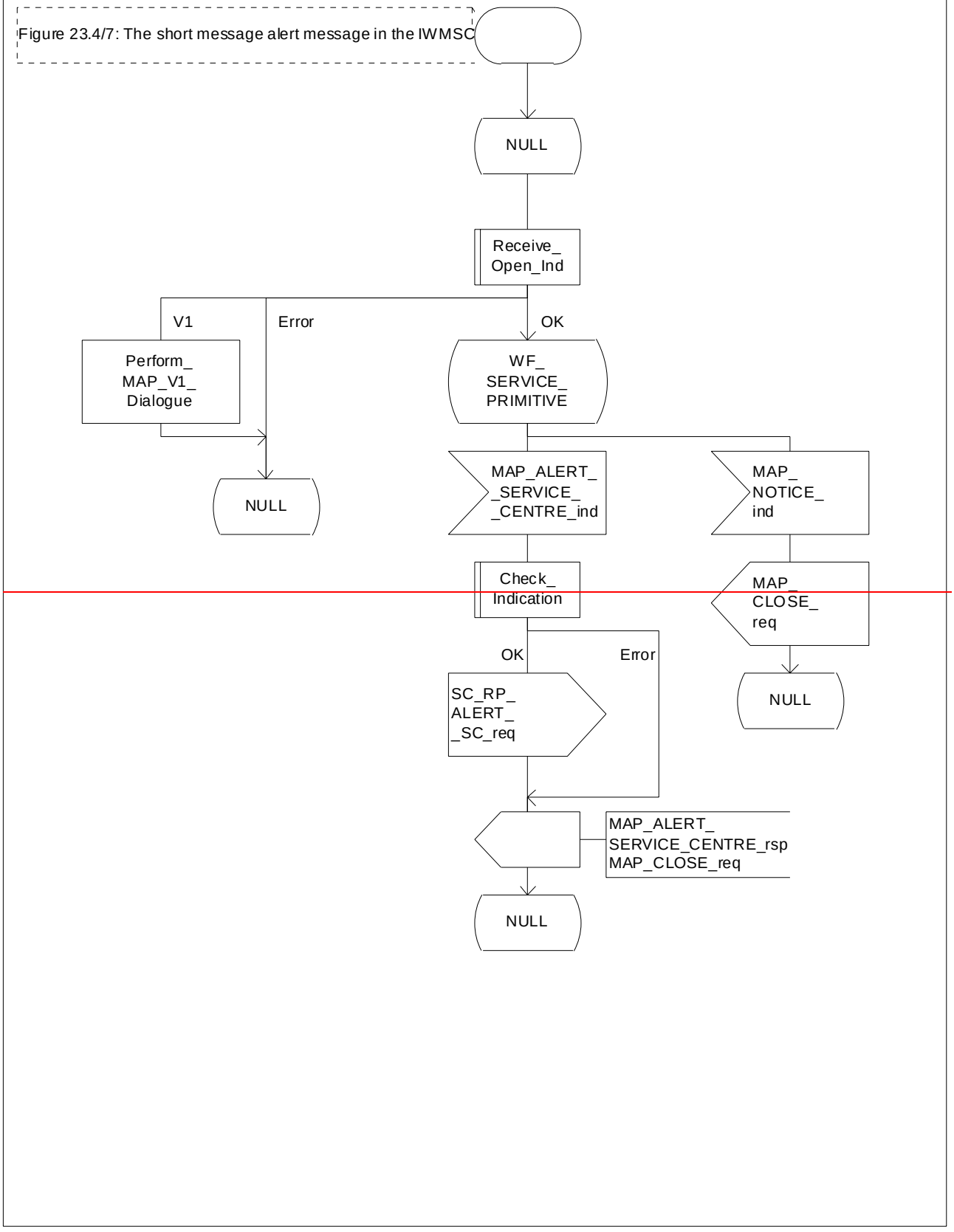
~~When a MAP_ALERT_SERVICE_CENTRE indication is correctly received by the IWMSC, the IWMSC will forward the alerting to the given Service Centre if possible.~~

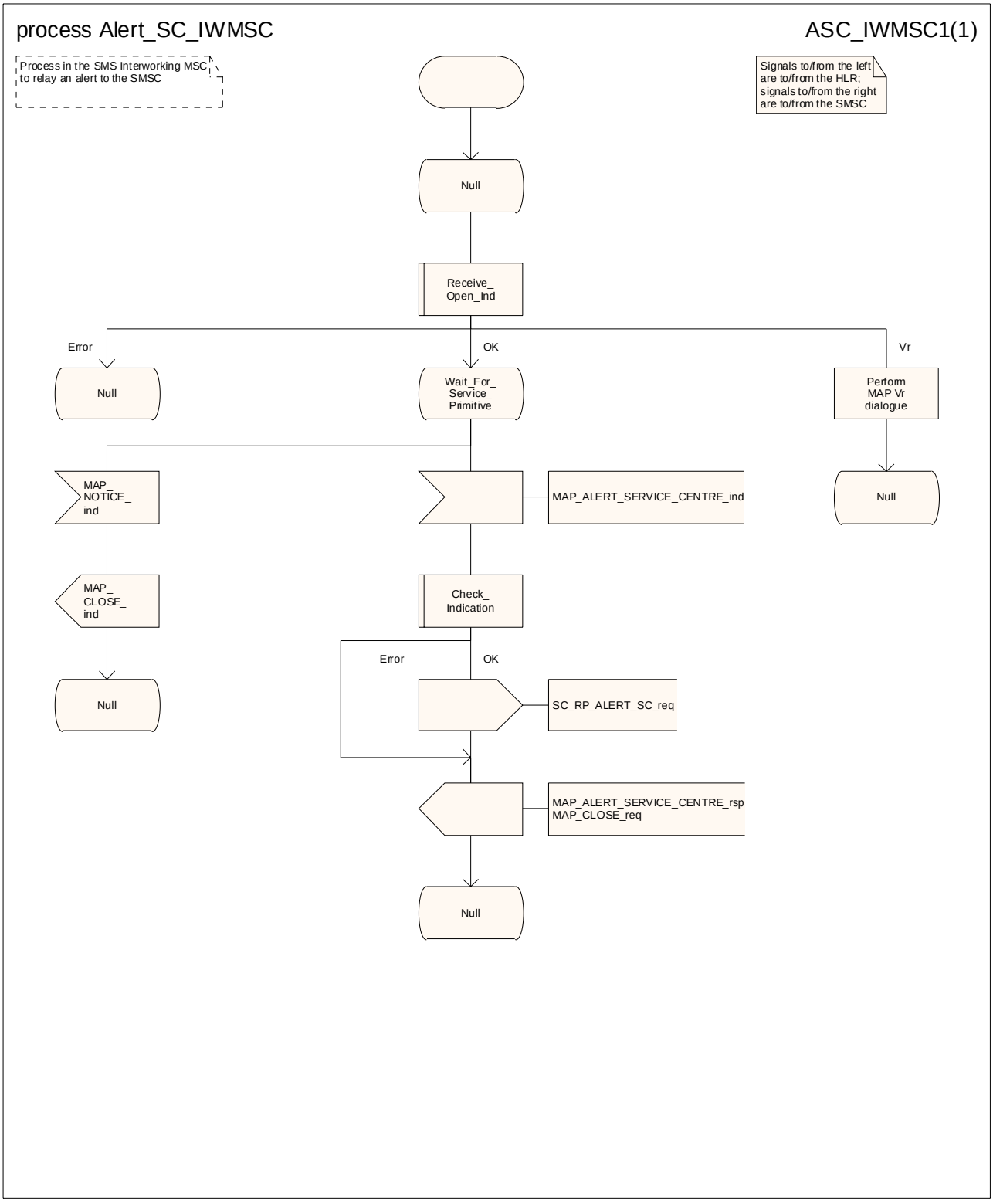
~~Data errors are reported to the HLR as an unexpected data value or a data missing error depending on the error.~~

The short message alert process~~dure~~ in the SMS-IWMSC is shown in figure 23.4/7.

Process Alert_SC_IWMSC 23.4_7(1)

Figure 23.4/7: The short message alert message in the IWMSC





CR editor's note: there is no technical difference; the SDL just looks tidier!

Figure 23.4/7: Process Alert_SC_IWMSC

23.4.5 Procedures in the ~~Servicing~~ SGSN

23.4.5.1 The Mobile Subscriber is present

If the SGSN successfully handles a ~~When receiving~~ Page response, Attach request or Routing ~~a~~Area ~~u~~Update request message~~s~~ (3GPP TS 24.008 [35]), while the MS ~~n~~Not ~~r~~Reachable for GPRS (MNRG) flag is set, the SGSN ~~will~~ sends ~~the~~ a MAP_READY_FOR_SM request to~~wards~~ the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS. If authentication fails during the handling of a Page response, Attach request or Routing Area Update request, the SGSN shall not send a MAP_READY_FOR_SM request to the HLR

~~When receiving the answer, the SGSN will act as follows:~~

- ~~MNRG is cleared if the procedure is successful~~
- ~~MNRG is not cleared if the procedure is not successful~~

The process in the SGSN is described in detail in ~~the~~ subclause 25.10/3.

23.4.5.2 The Mobile Equipment has memory available

The process is triggered by an RP_SM_MEMORY_AVAILABLE indication from the MS.

The SGSN requests a dialogue with the HLR, including a MAP_READY_FOR_SM request with Ready for SM reason Memory available for GPRS, and waits for the confirmation of the dialogue.

- if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN returns an error response containing an RP_ERROR "Network out of order", and the process returns to the Null state;
- if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN returns an error response containing an RP_ERROR "Facility not supported", and the process returns to the Null state;
- if the macro Receive_Open_Cnf takes the "OK" exit, the VLR waits for a response from the HLR.

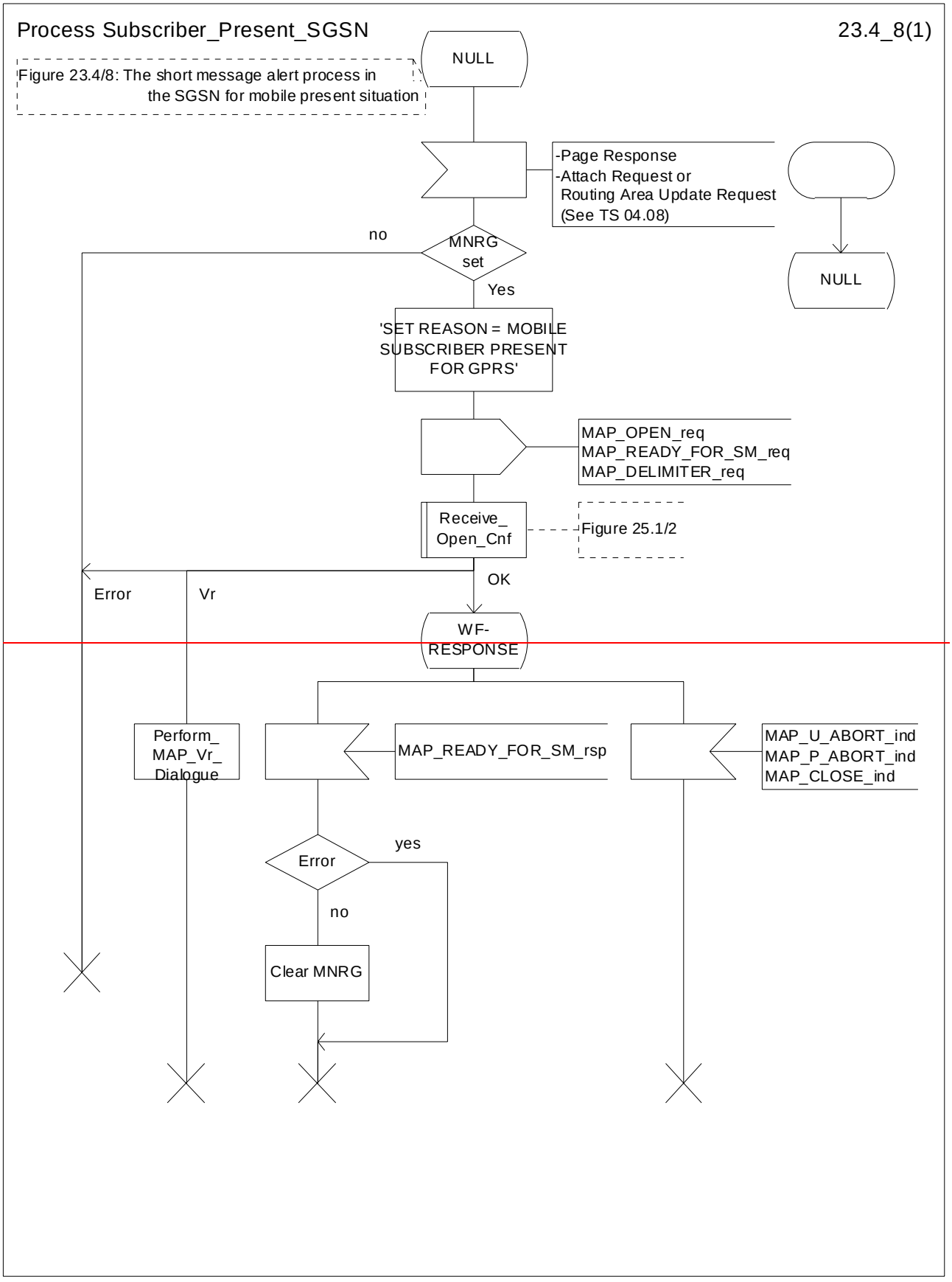
When the SGSN is waiting for a response from the HLR:

- if the dialogue with the HLR fails, the SGSN returns an error response containing an RP_ERROR "Network out of order", and the process returns to the Null state;
- if it receives a Release indication from the Gb interface, it aborts the dialogue with the HLR, and the process returns to the Null state;
- if the SGSN receives a MAP_READY_FOR_SM confirmation, it checks the confirmation.
  - if the confirmation contains an error, the SGSN returns returns an error response containing the appropriate RP_ERROR, and the process returns to the Null state;
  - if the confirmation indicates success, the SGSN returns an RP_ACK, and the process returns to the Null state.

~~After receiving the SM memory capacity available indication, the servicing SGSN sends the MAP_READY_FOR_SM request to the HLR indicating memory available for GPRS. The outcome of that procedure is one of the following:~~

- ~~successful acknowledgement. The SGSN sends the corresponding message to the MS;~~
- ~~negative acknowledgement, where the error causes are treated as follows:~~
  - ~~unexpected data value, data missing and system failure errors are reported as network out of order error to the MS;~~
  - ~~facility not supported is reported as requested facility not implemented error to the MS;~~
- ~~procedure failure, which is reported as network out of order error to the MS if a connection to the MS still exists.~~

The short message alert procedure in the SGSN for the MS memory capacity available case is shown in figure 23.4/8.



CR editor's note: this process is described in clause 25

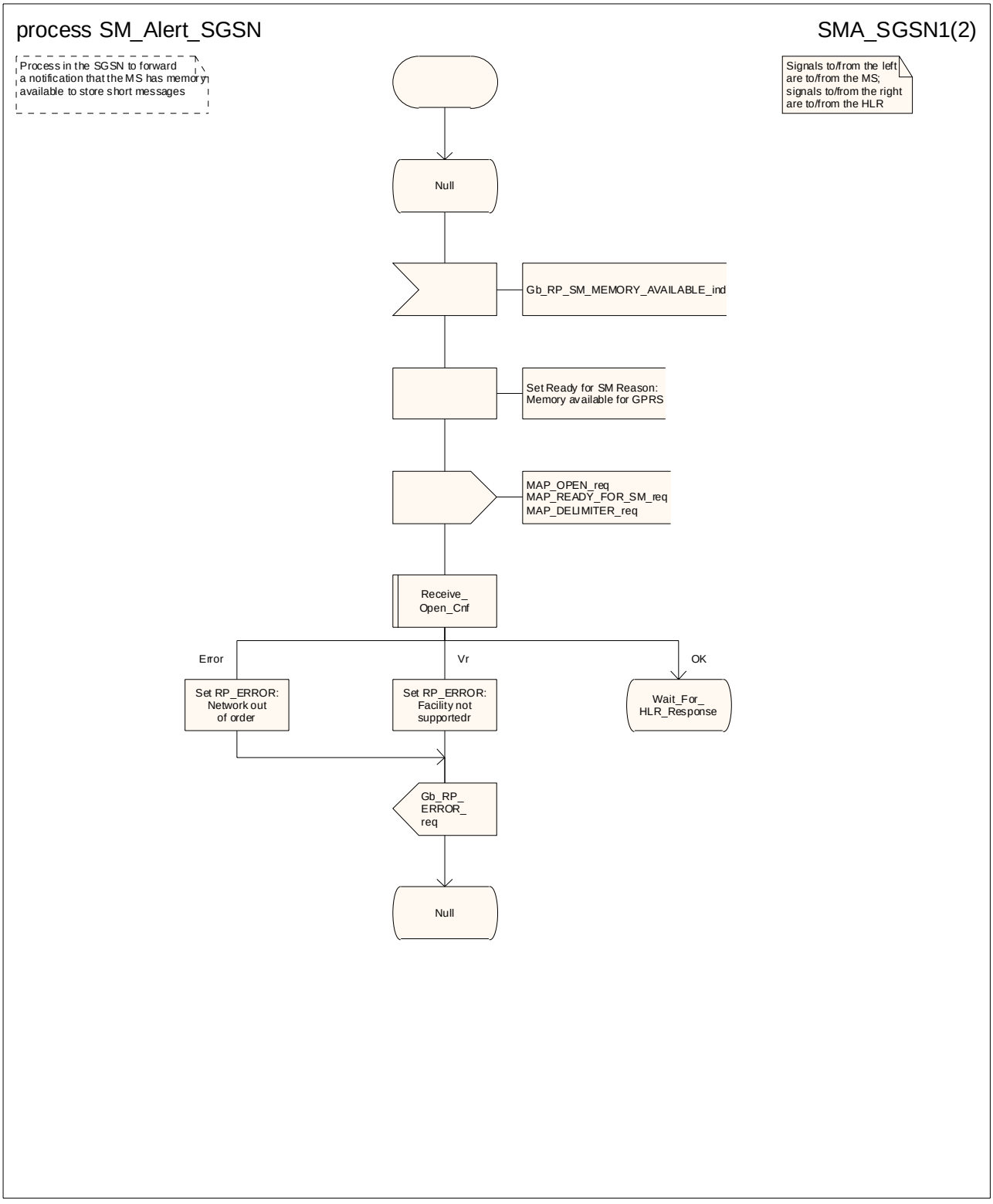


Figure 23.4/8 (sheet 1 of 2): Process ~~Subscriber_Present~~SM_Alert_SGSN

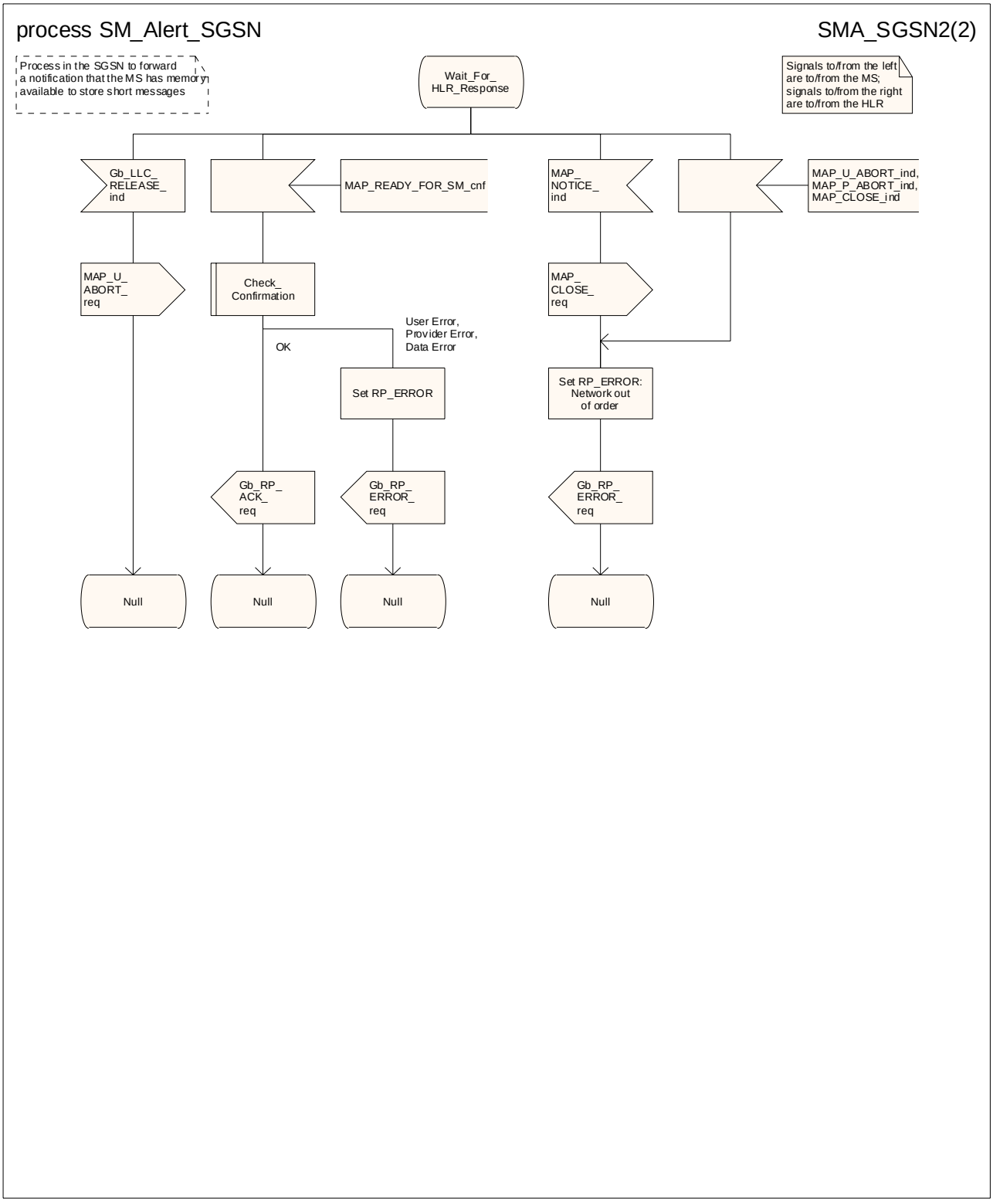


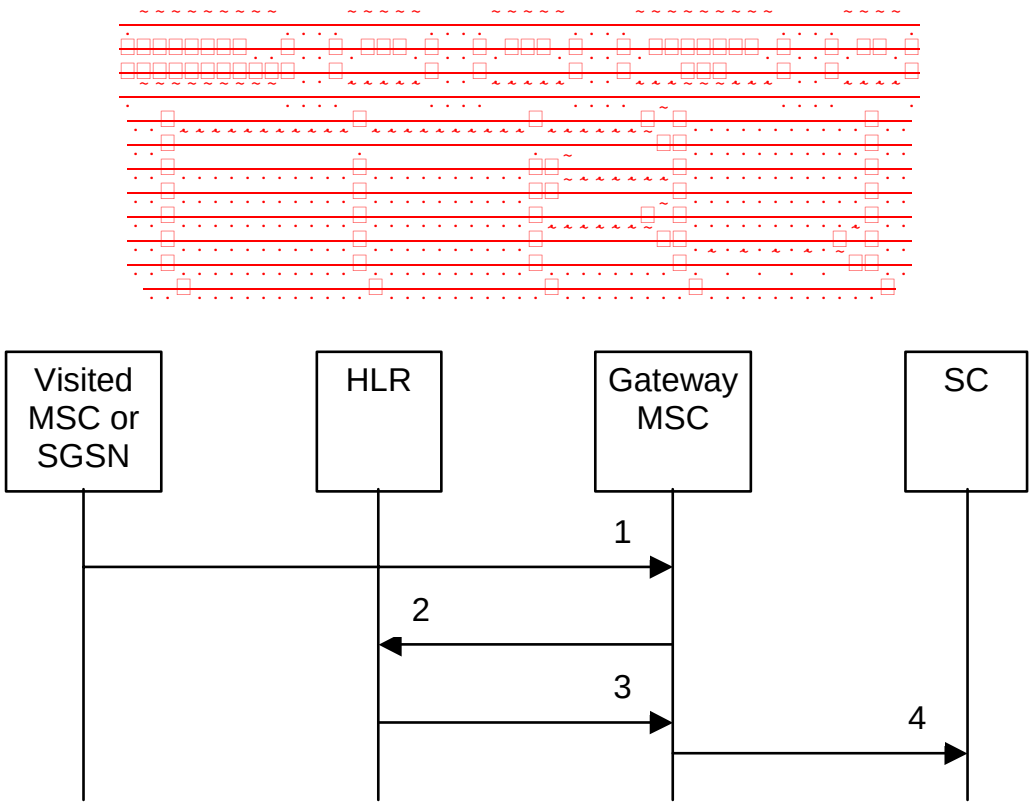
Figure 23.4/8 (sheet 2 of 2): Process SM_Alert_SGSN

23.5 The SM delivery status report procedure

The SM delivery status report procedure is used:

- to set the Service Centre address into the message waiting list in the HLR after short message delivery has failed because the subscriber is absent or unidentified or the memory capacity is exceeded. The procedure sets:
  - the mMemory cCapacity eExceeded fFlag (MCEF) in the HLR if the MS memory does not have room for more messages;
  - and/or the MS nNot rReachable fFlag for non-GPRS in the case ofif there is no record for the subscriber in the VLR unidentified or absent the subscriber does not respond to paging for delivery via the MSC;
  - and/or the MS nNot rReachable for GPRS (MNRG) flag in the case of unidentified if there is no record for the subscriber in the SGSN or absent the subscriber does not respond to paging for delivery via the SGSN.GPRS
- Additionally the procedure is used to report to the HLR about the successful transfer for GPRS or non GPRS after the Service Centre has polled the subscriberthat delivery has succeeded. This procedure isThe conditions for report of a successful delivery are described also in the subclause 23.3.14.

The message flow for the SM delivery status report procedure is shown in figure 23.5/1.



1) MAP_MT_FORWARD_SHORT_MESSAGE_ACK/_NACK (Absent subscriber_SM, unidentified subscriber or memory capacity exceeded).
2) MAP_REPORT_SM_DELIVERY_STATUS.
3) MAP_REPORT_SM_DELIVERY_STATUS_ACK.
4) Short Message Negative Acknowledgement (3GPP TS 23.140).

Figure 23.5/1: Short message delivery status report procedure

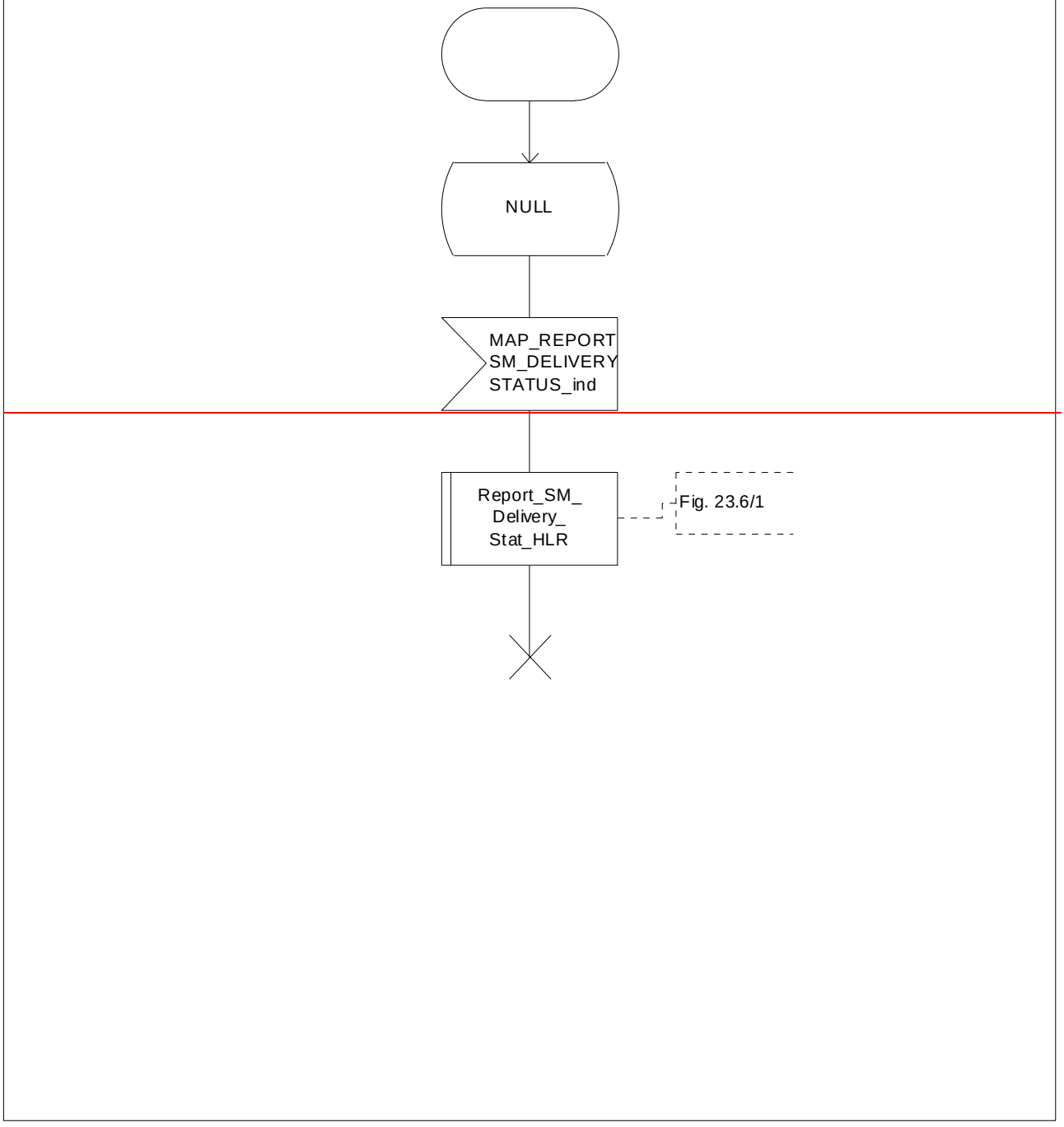
23.5.1 Procedures in the HLR

When the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it acts as described in the subclause 23.6, macro Report_SM_Delivery_Stat_HLR.

The short message delivery status report process in the HLR is shown in figure 23.5/2.

Process SM_Delivery_Status_Report_HLR 23.5_2(1)

Figure 23.5/2: The report SM delivery process in the HLR



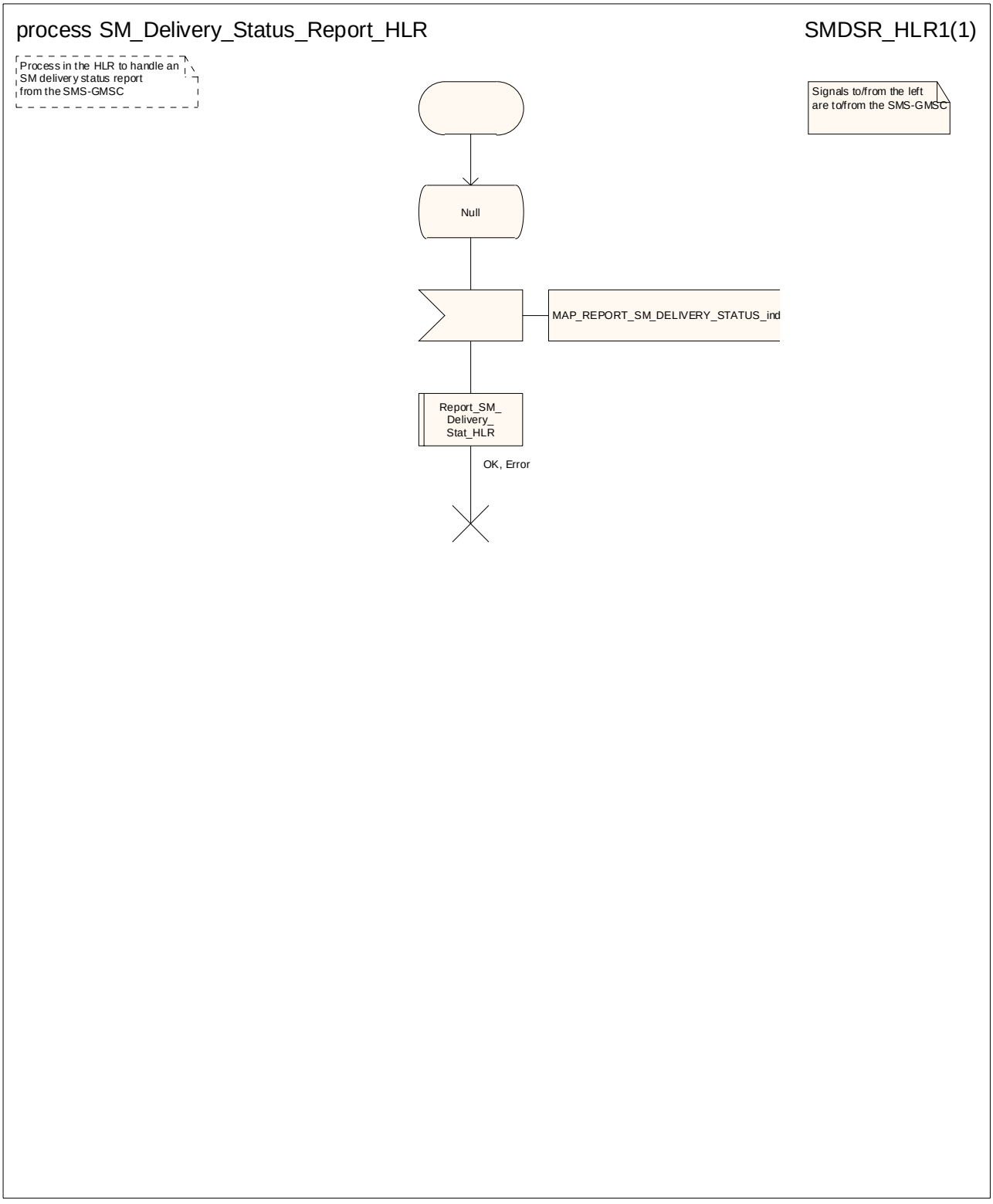


Figure 23.5/2: Process SM_Delivery_Status_Report_HLR

23.5.2 Procedures in the gateway SMS-GMSC

The conditions for the GMSC to invokes the short message delivery status report procedure are specified in subclause 23.3.1.if an absent subscriber_SM indication, unidentified subscriber indication, SM delivery failure error indicating MS memory capacity exceeded or both are received from the servicing MSC, SGSN or both during a mobile terminated short message transfer, and the HLR has not indicated that the SC address is included in the MWD. The unidentified subscriber indication is however processed as the absent subscriber_SM indication.

In case of successful SMS delivery on the second path, the successful SMS Delivery outcome is sent in combination with the unsuccessful SMS Delivery outcome to the HLR.

The service is invoked also when the HLR has indicated that either of the flags MCEF, MNRF or both are set and the first SM delivery was successful from the servicing MSC or, in case of subsequent SM, the last SM delivery was successful from the servicing MSC.

The service is invoked also when the HLR has indicated that either of the flags MCEF, MNRF or both are set and the SM delivery was successful from the servicing SGSN or, in case of subsequent SM, the last SM delivery was successful from the servicing SGSN.

The SMS-GMSC requests a MAP dialogue and sends a MAP_REPORT_SM_DELIVERY_STATUS request to the HLR containing the subscriber data of the mobile subscriber.

- if the macro Receive_Open_Cnf takes the "Error" exit, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;
- if the macro Receive_Open_Cnf takes the "V1" exit, the SMS-GMSC checks the delivery result.
  - if delivery was successful, or delivery failed with any reason other than "Absent subscriber", the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;
  - if delivery failed with a reason of "Absent subscriber", the SMS-GMSC handles the dialogue according to the specification for the earlier version 1 of the protocol, and the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit;
- if the macro Receive_Open_Cnf takes the "Vr" exit (for a version greater than 1), the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol, and the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit;
- if the macro Receive_Open_Cnf takes the "OK" exit, the SMS-GMSC waits for a response from the HLR.

When the SMS-GMSC is waiting for a response from the HLR:

- if the dialogue with the HLR fails, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;
- if it receives a MAP_REPORT_SM_DELIVERY_STATUS confirmation, it checks the confirmation.
  - if the confirmation contains an error, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;
  - if the confirmation indicates a successful result, the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit.

The reason for unsuccessful, successful for GPRS, non GPRS or both deliveries of the short message are included in the SM Delivery Outcome inIf delivery was successful, the MAP_REPORT_SM_DELIVERY_STATUS request indicates whether delivery succeeded for GPRS or non-GPRS.

In the case of an If delivery was unsuccessful delivery due tobecause the subscriber being was absent, the absent subscriber diagnostic indication (if available) is also included in the MAP_REPORT_SM_DELIVERY_STATUS request includes the absent subscriber diagnostic indication (if available).

If the reason for unsuccessful delivery is absent subscriber with diagnostic 'Paging failure' for GPRS or non GPRS, the MAP_REPORT_SM_DELIVERY_STATUS request includes the two SM Delivery Outcomes absent subscriber with both diagnostics 'Paging failure' for GPRS and non- GPRS. is included in the MAP_REPORT_SM_DELIVERY_STATUS request.

The GMSC sends the MAP_REPORT_SM_DELIVERY_STATUS request to the HLR. As a response the GMSC will receive the MAP_REPORT_SM_DELIVERY_STATUS confirmation reporting:

- successful outcome of the procedure. The acknowledge primitive may contain the MSISDN-Alert number which is stored in the MWD List in the HLR;

- unsuccessful outcome of the procedure. The system failure indication is forwarded to the SC. In that case, if the SM Delivery Outcome was successful SMS delivery for GPRS or non GPRS (combined or not with another unsuccessful reason), a successful report is forwarded to the SC.

A provider error is indicated as a system failure to the SC.

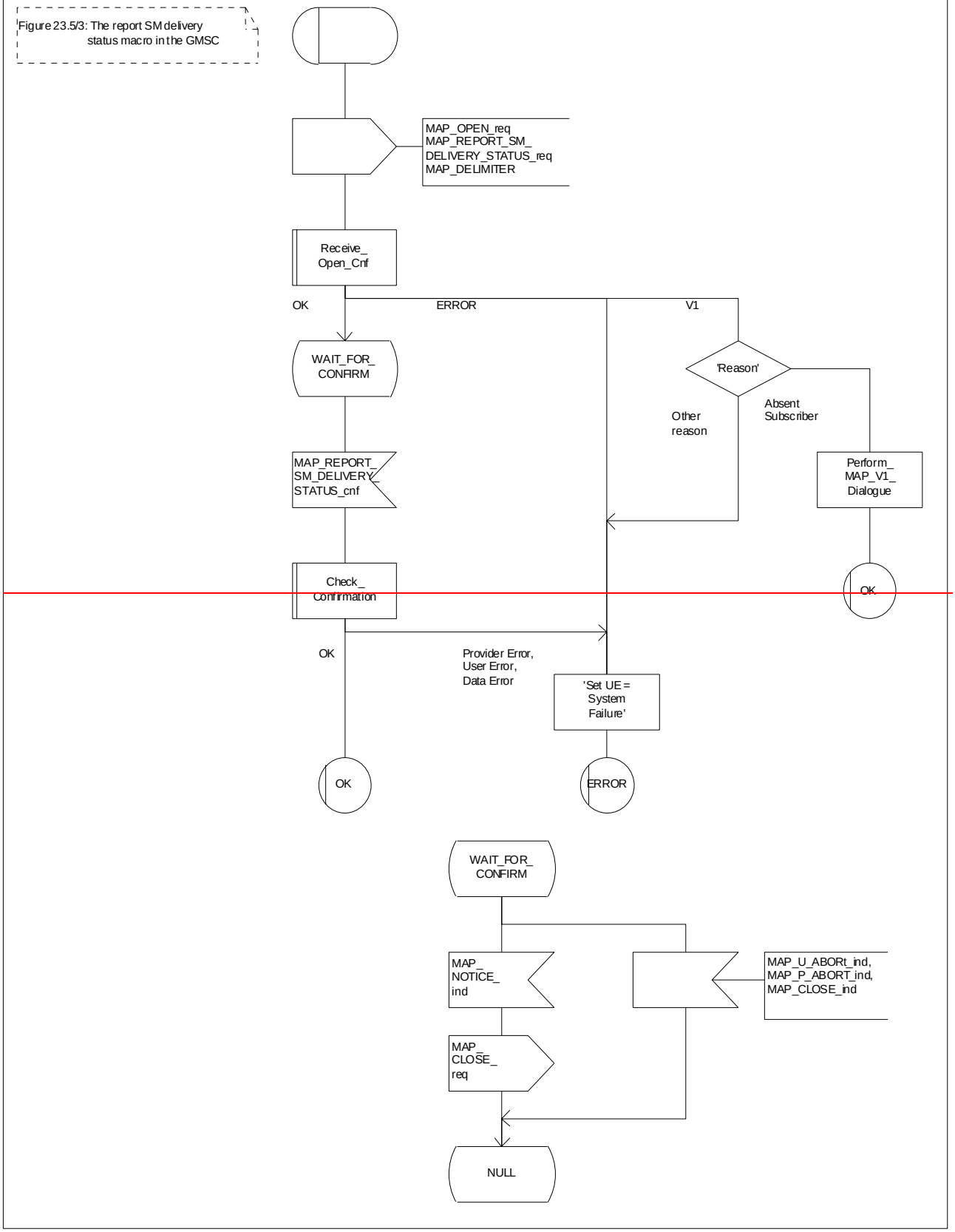
Note that the indication, of which number belongs the SGSN and which to the MSC, received from the HLR at in the routing information result (see subclause 23.3.23) will enable the GMSC to map the causes received from the SGSN, MSC or both into the appropriate causes for GPRS, non-GPRS or both, and send them to the SC and HLR.

The procedure towardsdialogue with the Service Centre may also be aborted. If so the SMS-GMSC aborts the operation towardsdialogue with the HLR is also aborted.

The short message delivery status report procedure macro in the SMS-GMSC is shown in figure 23.5/3.

Macrodefinition Report_SM_Delivery_Stat_GMSC 23.5_3(1)

Figure 23.5/3: The report SM delivery status macro in the GMSC



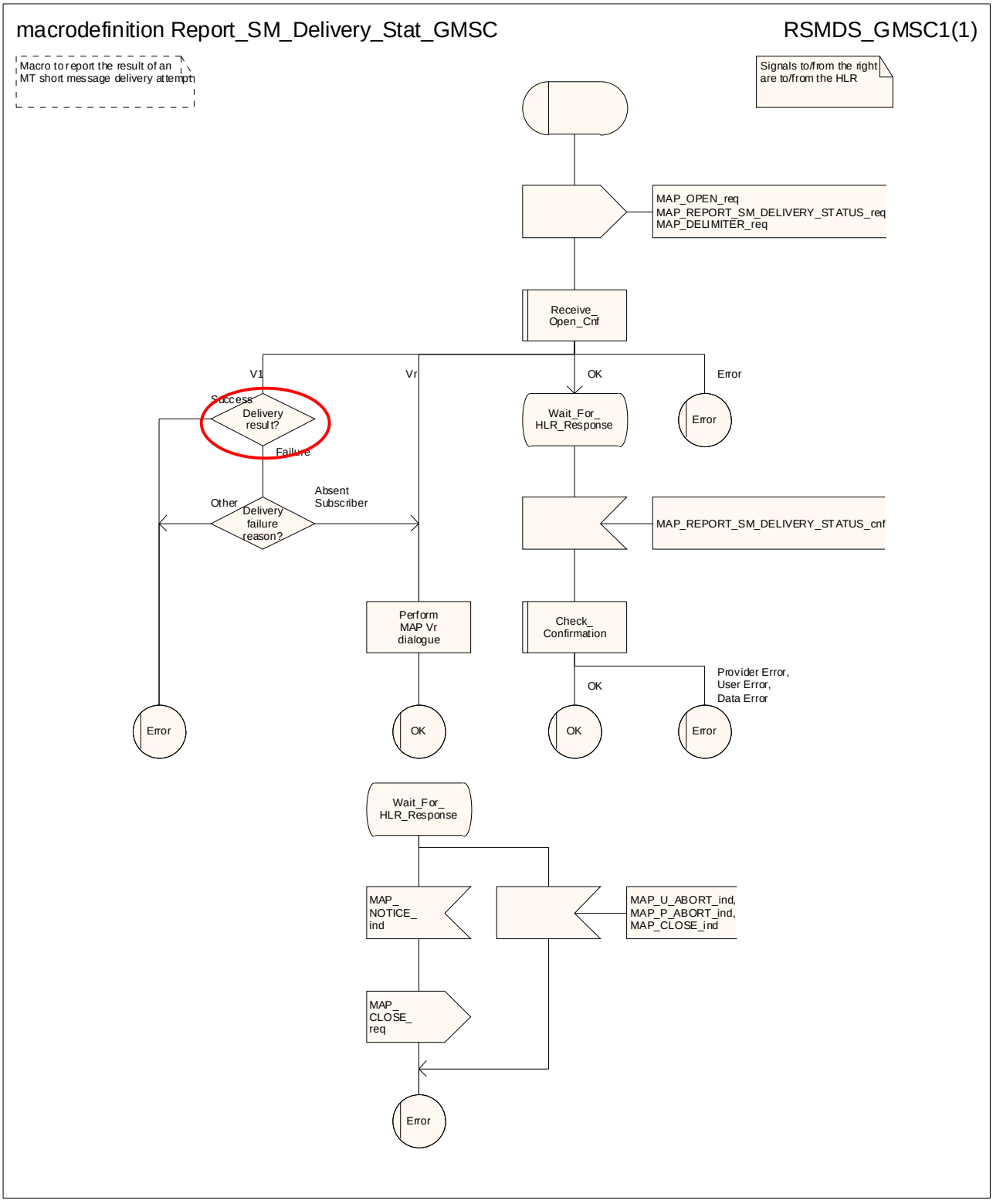


Figure 23.5/3: Macro Report_SM_Delivery_Stat_GMSC

23.6 ~~Common procedures for the short message clause~~The macro Report_SM_Delivery_Stat_HLR

~~23.6.1 The macro Report_SM_Delivery_Stat_HLR~~

This macro is ~~used~~ invoked when the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication from the SMS-GMSC. The HLR ~~responses to~~handles the indication as follows:

- if the indication is badly formed, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the appropriate User Error, and the macro takes the "Error" exit;
- if there is no record in the HLR for the subscriber, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the User Error "Unknown subscriber", and the macro takes the "Error" exit;
- if the MAP_REPORT_SM_DELIVERY_STATUS indication did not include the GPRS support indicator, the HLR deduces the domain for which the delivery report applies as follows:
  - if the subscriber is a GPRS-only subscriber, the report applies for GPRS;
  - if the subscriber is a non-GPRS-only subscriber, the report applies for non-GPRS;
  - if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the SGSN", the report applies for GPRS;
  - if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the MSC", the report applies for non-GPRS;
- if the MAP_REPORT_SM_DELIVERY_STATUS indication indicated delivery failure, the HLR attempts to add the SC address to the MWD list.
  - if the update of the MWD list failed, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the User Error "MWD list full", and the macro takes the "Error" exit;
  - if the update of the MWD list succeeded, the HLR sets the variable Delivery Result to Failure, and continues to process the delivery failure report:
    - if the MSISDN used to define the destination MS was not the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_REPORT_SM_DELIVERY_STATUS response;
    - if the delivery failure cause was MS memory capacity exceeded for non-GPRS, the HLR sets the MCEF and clears the MNRF;
    - if the delivery failure cause was MS memory capacity exceeded for GPRS, the HLR sets the MCEF and clears the MNRG flag;
    - if the delivery failure cause was Absent Subcriber for non-GPRS, the HLR sets the MNRF;
    - if the delivery failure cause was Absent Subcriber for GPRS, the HLR sets the MNRG flag;
    - if the delivery failure cause was Absent Subcriber for non-GPRS and GPRS, the HLR sets the MNRF and the MNRG flag;
    - if the delivery cause was absent subscriber and the MAP_REPORT_SM_DELIVERY_STATUS indication included a reason for absence, the HLR stores the reason for absence in the Mobile Not Reachable Reason and calls the procedure Check_Absent_Subscriber_SM_In_HLR (~~9~~see 3GPP TS 23.116 [110];
    - the HLR returna a MAP_REPORT_SM_DELIVERY_STATUS response indicating success, and the macro takes the "OK" exit.
- if the MAP_REPORT_SM_DELIVERY_STATUS indication indicated successful transfer,the HLR handles the indication as follows:

- if the delivery outcome was for non-GPRS, the HLR clears the MNRF and the MCEF;
- if the delivery outcome was for GPRS, the HLR clears the MNRG flag and the MCEF;
- the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response indicating success;
- the HLR invokes the macro Alert_Service_Centre_HLR to alert the service centres whose addresses are in the MWD list, as described in subclause 25.10;
- the HLR sets the variable Delivery Result to Success, and the macro takes the "OK" exit.

~~- if the flag « GPRS Support Indicator » is absent then if the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only, the HLR shall interpret the delivery outcome as a GPRS delivery outcome.~~

~~- if invalid data content is detected, an unexpected data value error or a data missing error is returned to the GMSC;~~

~~- if the MSISDN number provided is not recognised by the HLR, an unknown subscriber error is returned to the GMSC;~~

~~- if the MAP_REPORT_SM_DELIVERY_STATUS indication reports a successful SM delivery, the Service Centres in the Message Waiting list are alerted as described in the clause 25.10;~~

~~- if the SM Delivery Outcome reports unsuccessful delivery and the inclusion of the SC address in the MWD is not possible, a message waiting list full error is returned to the GMSC;~~

~~- if the SM Delivery Outcome reports unsuccessful delivery and the message waiting list is not full, the given Service Centre address is inserted and an acknowledgement is sent to the GMSC. If the MSISDN-Alert stored in the subscriber data is not the same as that received in the MAP_REPORT_SM_DELIVERY_STATUS indication, the MSISDN-Alert is sent in a response primitive to the GMSC;~~

~~- The SC address is only stored in the MWD if the unsuccessful SM Delivery Outcome is not received in combination with another successful SM Delivery Outcome~~

~~- if the SM Delivery Outcome is MS memory capacity exceeded for non GPRS, the HLR sets the memory capacity exceeded flag in the subscriber data and resets the MNRF;~~

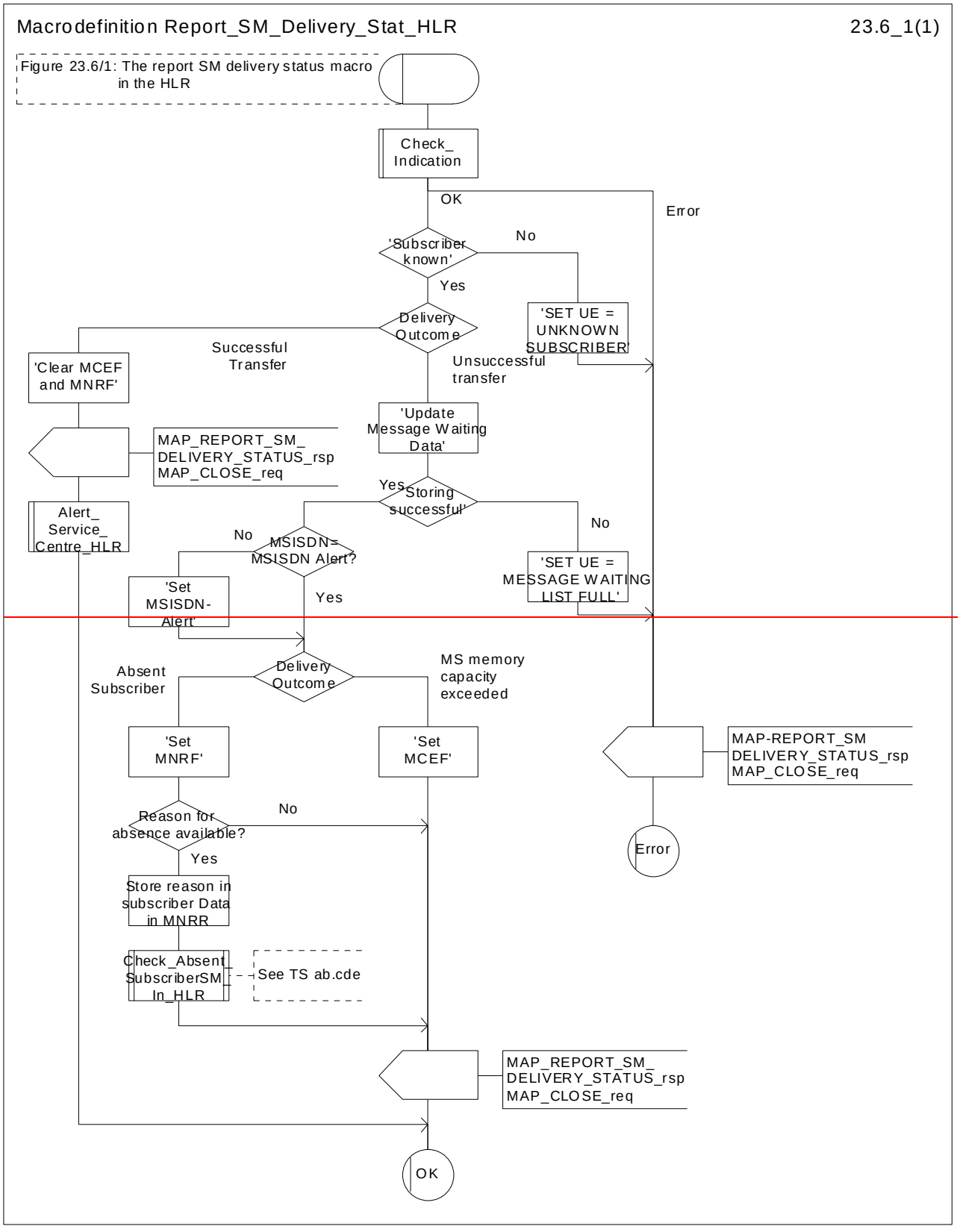
~~- if the SM Delivery Outcome is MS memory capacity exceeded for GPRS the HLR sets the memory capacity exceeded flag in the subscriber data and resets the MNRG;~~

~~- if the SM Delivery Outcome is absent subscriber for non GPRS, the HLR sets the mobile station not reachable flag in the subscriber data. If a reason for absence is provided by the GMSC then this is stored in the mobile station not reachable reason (MNRR) in the subscriber data.~~

~~- if the SM Delivery Outcome is absent subscriber for GPRS, the HLR sets the mobile station not reachable for GPRS flag in the subscriber data. If a reason for absence is provided by the GMSC then this is stored in the mobile station not reachable reason (MNRR) in the subscriber data.~~

~~Note that a combination of all the SM Delivery Outcome specified above may be provided to the HLR from the SMS-GMSC.~~

The short message delivery status report macro in the HLR is shown in figure 23.6/1.


Macrodefinition Report_SM_Delivery_Stat_HLR
23.6_1(1)
Figure 23.6/1: The report SM delivery status macro in the HLR
Check_ Indication
OK
Error
'Subscriber known'
No
Yes
Delivery Outcome
'SET UE = UNKNOWN SUBSCRIBER'
Successful Transfer
Unsuccessful transfer
'Clear MCEF and MNRF'
'Update Message Waiting Data'
MAP_REPORT_SM_ DELIVERY_STATUS_rsp MAP_CLOSE_req
Yes
'Storing successful'
No
Alert_ Service_ Centre_HLR
No
MSISDN= MSISDN Alert?
'SET UE = MESSAGE WAITING LIST FULL'
'Set MSISDN-Alert'
Yes
Absent Subscriber
Delivery Outcome
MS memory capacity exceeded
'Set MNRF'
'Set MCEF'
MAP-REPORT_SM DELIVERY_STATUS_rsp MAP_CLOSE_req
Reason for absence available?
No
Error
Yes
Store reason in subscriber Data in MNRR
Check_Absent_ SubscriberSM_ In_HLR
See TS ab.cde
MAP_REPORT_SM_ DELIVERY_STATUS_rsp MAP_CLOSE_req
OK

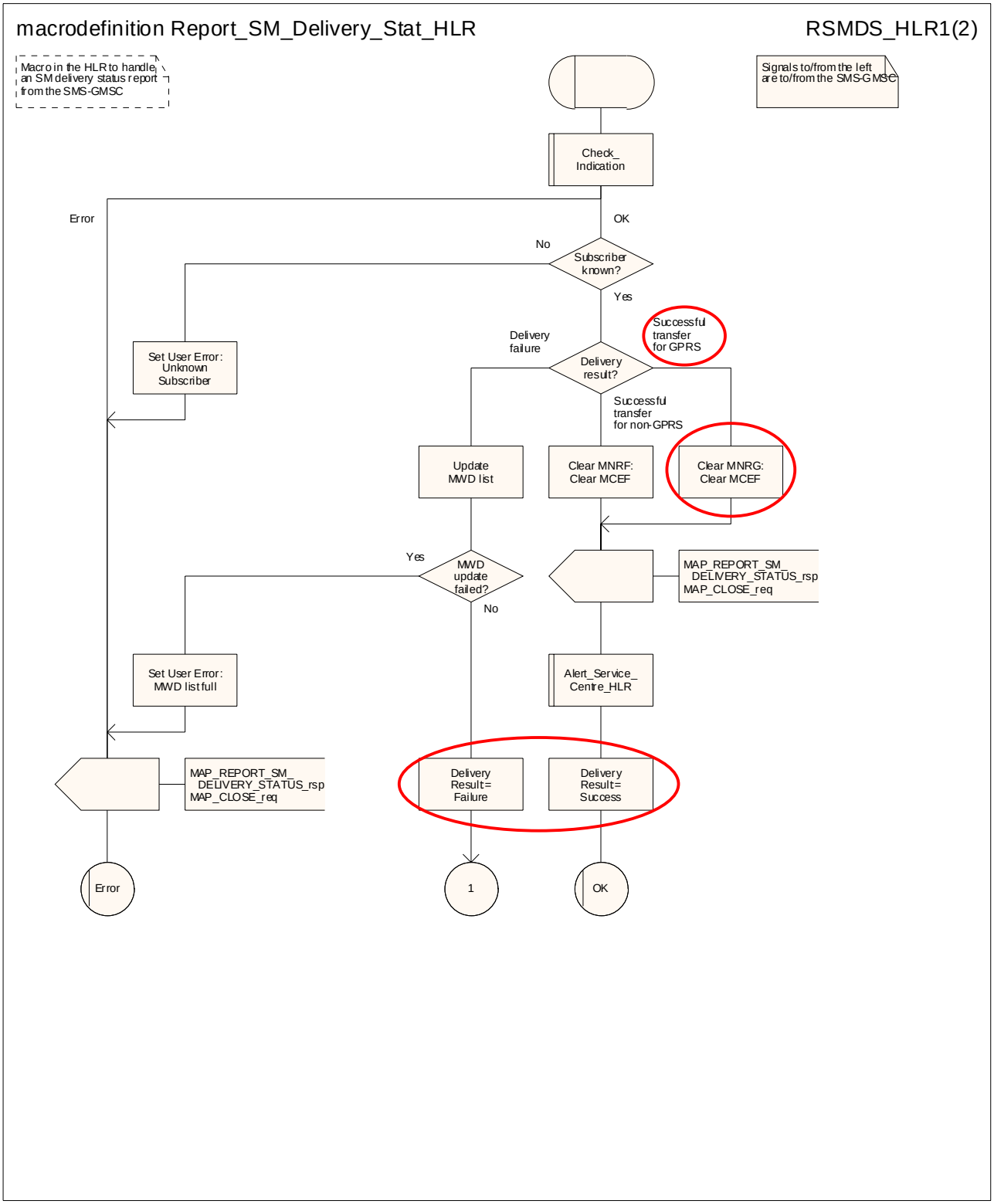


Figure 23.6/1 (sheet 1 of 2): Macro Report_SM_Delivery_Stat_HLR

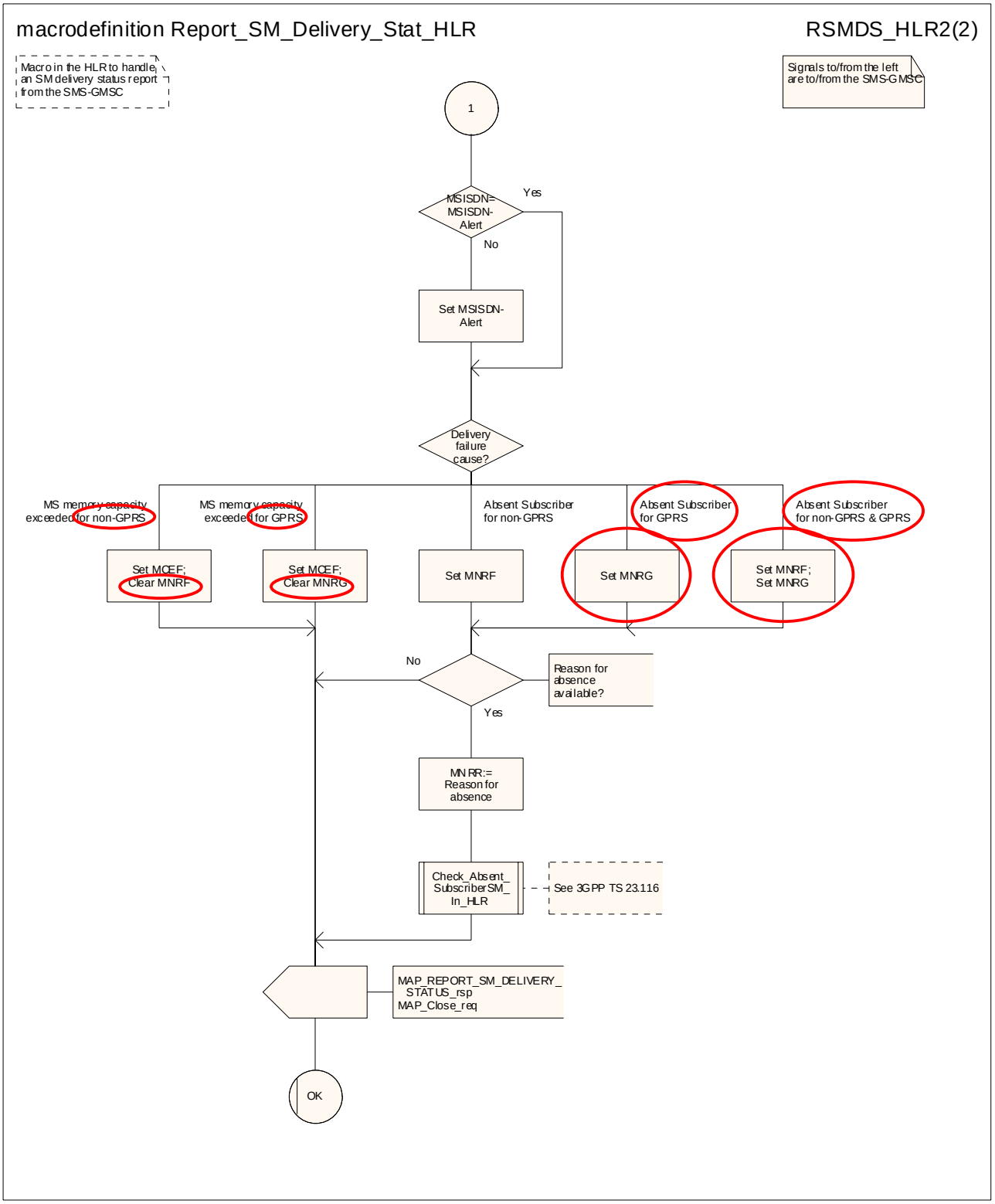


Figure 23.6/1 (sheet 2 of 2): Macro Report_SM_Delivery_Stat_HLR

****** End of document ******

3GPP TSG CN WG4 Meeting #18 ***N4-030325***
Dublin, EIRE, 10th – 14th February 2003 **(Revision of N4-030292)**

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **524** ⌘**rev** **3** ⌘ Current version: **6.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Clean-up of SMS procedures chapter
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	19/02/2003
Category:	⌘	**A**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	Recent changes have cleaned up part of the SMS procedures chapter of TS 29.002. This has left a mixture of styles for both text and SDL diagrams. There are also several minor technical errors. Error corrections which are related to CAMEL handling, and which are therefore of specific interest to CN2, are on pages 24 (cf old version on pages 17 & 21) & 39 (cf old version on page 36)
Summary of change:	⌘	Redrawing of message flow diagrams and remaining SDL diagrams to improve layout. Editorial clean-up of text. Alignment of text with SDLs.
Consequences if not approved:	⌘	Several minor technical errors, and impaired readability

Clauses affected:	⌘	12.7; 23

Other specs affected: ⌘	Y	N	
		X	Other core specifications
		X	Test specifications
		X	O&M Specifications

⌘

Other comments: ⌘ The pretence of MAP dialogues between the MSC and the VLR leads to unnecessary complexity in the SDL diagrams (handling for MAP_NOTICE and MAP_P_ABORT, possibility of protocol version dropback). This has been removed, as a small step in the right direction. The logical conclusion would be to follow the example of chapter 21, and completely remove the interworking between the MSC and the VLR from 29.002, but that would be a **much** bigger undertaking! A further logical consequence of this approach has been to remove the possibility of transferring an IMSI as the Destination Reference in the

	(pseudo-) MAP_OPEN request which precedes the MAP_SEND_INFO_FOR_MT_SMS request. Instead, the IMSI is added as a parameter of the MAP_SEND_INFO_FOR_MT_SMS request in subclause 12.7. The removal of the handling for MAP_NOTICE and MAP_P_ABORT, and the possibility of protocol version dropback, from the interworking between the MSC and VLR has not been highlighted in the SDL diagrams. A text box has been added to each sheet of SDL which needs it, to state the convention for the source and destination of input and output signals. This has not been highlighted in the SDL diagrams. The ordering of returning a result or error indication to the requesting entity and reporting the outcome of SM delivery or submission to the gsmSCF has been systematically changed to put the reporting to the gsmSCF **after** the return of the result or error to the requesting entity; this reduces the delay in returning a result or error indication to the requesting entity. This change has not been highlighted in the SDL diagrams. The handling of protocol dropback in both the dialogue initiating entity and the dialogue responding entity has been updated to recognise the fact that the macros Receive_Open_Cnf and Receive_Open_Ind have a "Vr" exit to denote the use of an earlier version of the protocol than the one specified in this version of 29.002. The earlier version of 29.002 assumed that the only earlier version of the protocol was "V1". This change has not been highlighted in the SDL diagrams. The changes to the descriptions of the behaviour of the SGSN for MO SMS and the HLR for MT SMS are closely based on those proposed in CR 29.002-509r2, but they omit the specific handling to make SS call barring apply to SMS transfer in the PS domain. If both CR 29.002-524 and CR 29.002-509 are approved, CR 29.002-509 should be implemented **after** CR 29.002-524. The ordering of the subclauses in 23.3 (handling of MT SMS) has been changed to 23.3.1: SMS-GMSC; 23.3.2: HLR; 23.3.3: VMSC; 23.3.4: VLR; 23.3.5: SGSN, to reflect the sequence in which these entities are involved in handling MT SMS. To ease the readability of the change request, the re-ordering has been done without change marks, except in the subclause and figure numbering. The change marks reflect the changes to the content of each subclause.

****** First modified section ******

12.7 MAP-SEND-INFO-FOR-MT-SMS service

12.7.1 Definition

This service is used between the MSC and the VLR. The service is invoked by the MSC receiving a~~n~~ mobile terminated short message to request subscriber related information from the VLR.

The MAP-SEND-INFO-FOR-MT-SMS service is a confirmed service using the primitives from table 12.7/1.

12.7.2 Service primitives

Table 12.7/1: MAP-SEND-INFO-FOR-MT-SMS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
SM RP DA	M	M(=)		
IMSI	C	C(=)		
MSISDN			C	C(=)
User error			C	C(=)
Provider error				O

12.7.3 Parameter use

Invoke id
See definition in clause 7.6.1.

SM RP DA
See definition in clause 7.6.8. This parameter shall contain either an IMSI or an LMSI.

IMSI
See definition in clause 7.6.2. This parameter shall be present if the SM RP DA parameter contains an LMSI; otherwise it shall be absent.

MSISDN
See definition in clause 7.6.2.

User error
The following errors defined in clause 7.6.1 may be used, depending on the nature of the fault:

- Unknown subscriber;
- Unidentified Subscriber;
- Absent subscriber;
- Unexpected Data Value;
- Data Missing;
- Illegal subscriber;
- Illegal equipment;
- Subscriber busy for MT SMS;
- System Failure.

Provider error
For definition of provider errors see clause 7.6.1.

****** Next modified section ******

23 Short message service procedures

23.1 General

The short message service procedures are used to control both mobile originated and mobile terminated short message transfer.

Four procedures exist for short message services:

- mobile originated short message service transfer;
- mobile terminated short message service transfer;
- short message alert procedure;
- short message waiting data set procedure.

The following application context refers to a complex MAP user consisting of several processes:

- shortMessageGatewayContext.

This application context needs a co-ordinating process in the HLR. Additionally a ~~C~~co-ordinating process~~or has to be~~is ~~defined~~ needed for the mobile originated situation in the MSC, because the A_CM_SERV_REQ message does not distinguish between mobile originated short message transfer and the short message alert procedures.

NOTE: the A_CM_SERV_REQ message is not used for SMS over GPRS. The modelling is based on the assumption that the SGSN will trigger the appropriate process, according to whether an RP_MO_DATA or an RP_SM_MEMORY_AVAILABLE is received over the LLC layer.

23.1.1 Mobile originated short message service Co-ordinator for the MSC

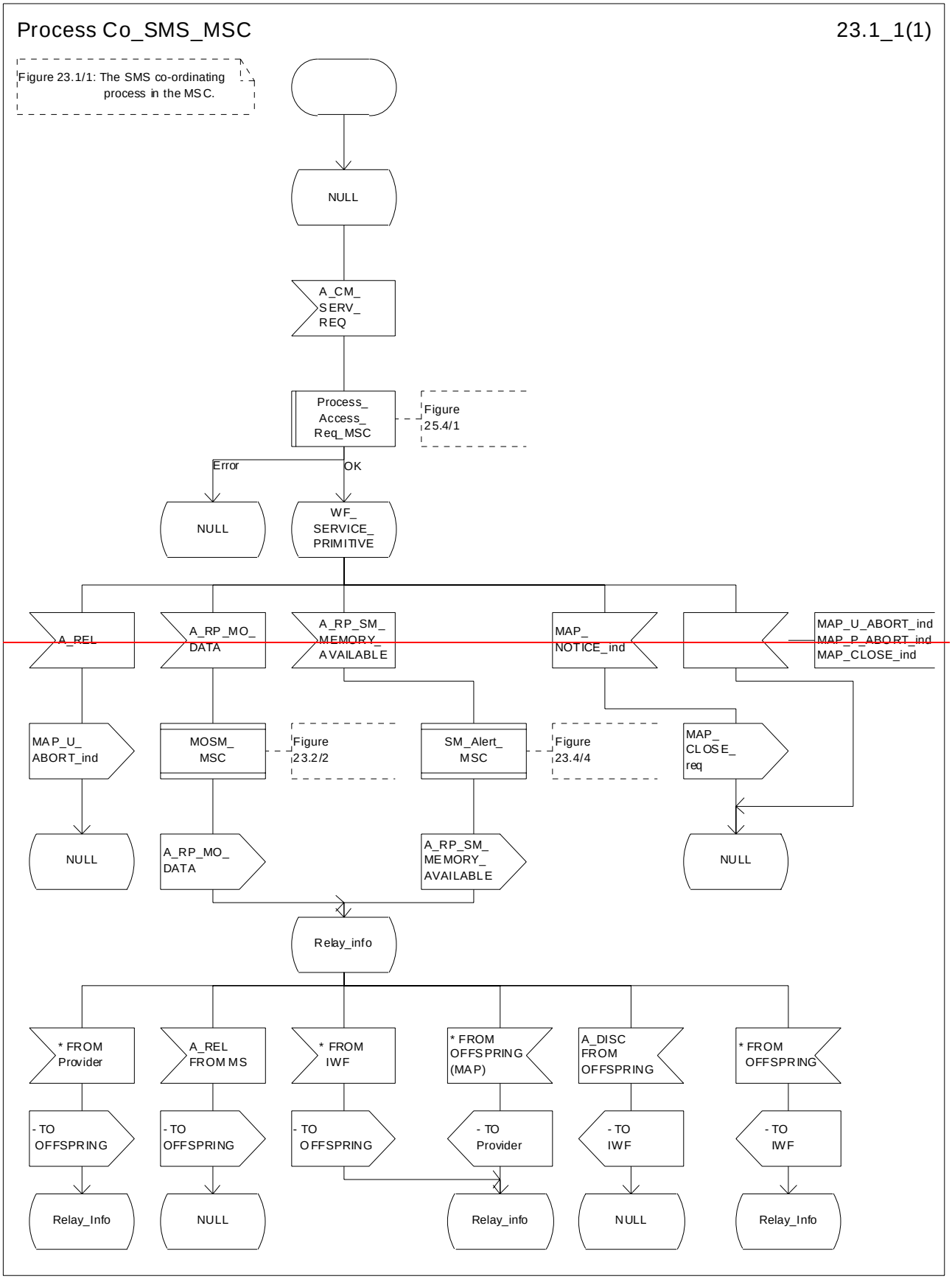
~~The~~ When the MSC receives an A_CM_SERV_REQ message (see 3GPP TS 24.008 [35]), with a CM service type indicating short message service, ~~is received~~ from the A-interface ~~containing the CM service type. This parameter indicates mobile originated short message service. The service~~, it invokes the macro Process_Access_Request_MSC to request the establisment of the CM connection. ~~MAP_PROCESS_ACCESS_REQUEST is started~~.

If the macro Process_Access_Request_MSC takes the "OK" exit (which means that the MSC has sent an A_CM_SERVICE_ACCEPT to the MS),~~MAP_PROCESS_ACCESS_REQUEST service ends successfully~~, the MS initiates mobile originated short message transfer or ~~alerting~~ sends an indication that it has memory available for more short messages. ~~Depending on the situation, t~~The MSC creates an instance of the appropriate process ~~is initiated~~ as follows:

- if the MSC receives an A_RP_MO_DATA indication ~~is received~~, it creates an instance of the process MO_SM_MSC ~~is initiated~~ (see subclause 23.2.1);
- if the MSC receives an A_RP_SM_MEMORY_AVAILABLE indication ~~is received~~, it creates an instance of the process SC_Alert_MSC ~~is initiated~~ (see subclause 23.4.1).

After it has created~~ion~~ the instance of the user process, the Co-ordinator relays the messages between the A-interface and the ~~invoked~~ child process and between the VLR and the child process until ~~a request or an indication for~~ the dialogue ~~termination~~ is terminated~~received~~.

The SMS ~~process~~ Co-ordinator process in the MSC is shown in ~~the~~ figure 23.1/1.


Process Co_SMS_MSC
23.1_1(1)
Figure 23.1/1: The SMS co-ordinating process in the MSC.
NULL
A_CM_ SERV_ REQ
Process_ Access_ Req_MSC
Figure 25.4/1
Error
OK
NULL
WF_ SERVICE_ PRIMITIVE
A_REL
A_RP_MO_ DATA
A_RP_SM_ MEMORY_ AVAILABLE
MAP_ NOTICE_ind
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
MAP_U_ ABORT_ind
MOSM_ MSC
Figure 23.2/2
SM_Alert_ MSC
Figure 23.4/4
MAP_ CLOSE_ req
NULL
A_RP_MO_ DATA
A_RP_SM_ MEMORY_ AVAILABLE
NULL
Relay_info
* FROM Provider
A_REL FROM MS
* FROM IWF
* FROM OFFSPRING (MAP)
A_DISC FROM OFFSPRING
* FROM OFFSPRING
- TO OFFSPRING
- TO OFFSPRING
- TO OFFSPRING
- TO Provider
- TO IWF
- TO IWF
Relay_Info
NULL
Relay_info
NULL
Relay_Info

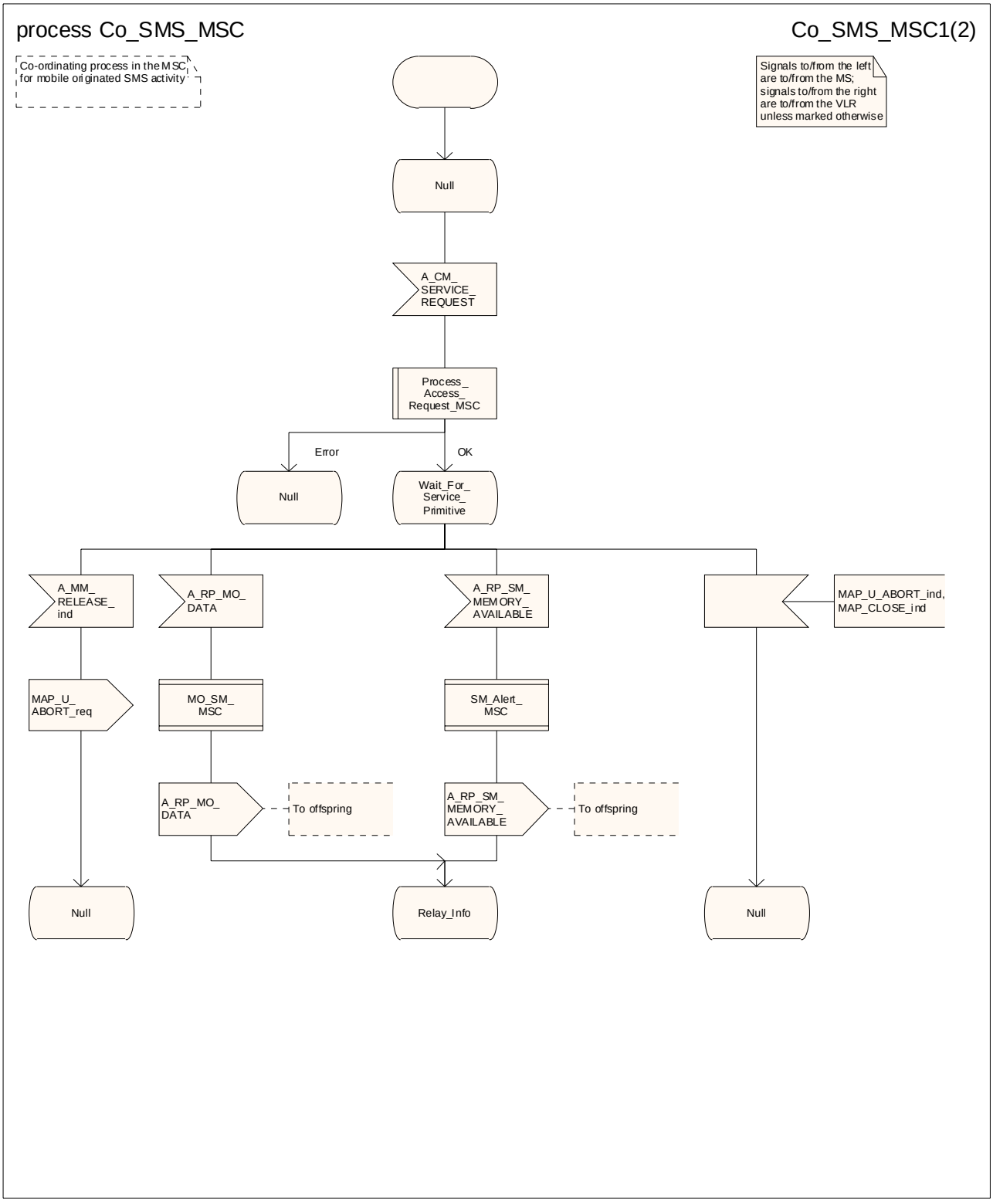


Figure 23.1/1 (sheet 1 of 2): Process Co_SMS_MSC

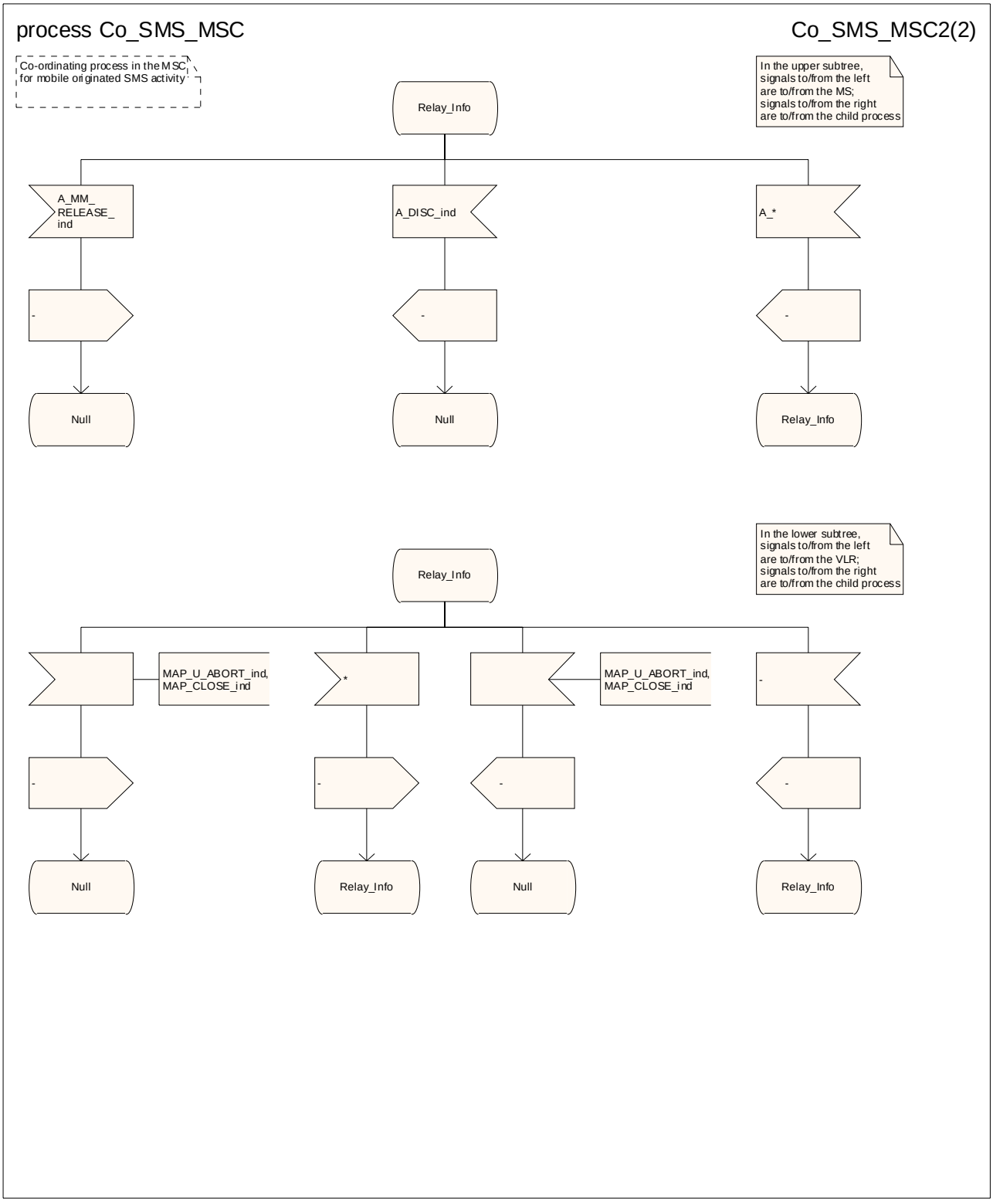


Figure 23.1/1 (sheet 2 of 2): Process Co_SMS_MSC

23.1.2 Short message Gateway Co-ordinator for the HLR

The process is started when the HLR receives a MAP_OPEN indication ~~opens a dialogue for the short message procedure between the gateway MSC and the HLR when~~using the application context shortMessageGatewayContext ~~is received~~. If ~~that service~~the dialogue opening is successful, the Co-ordinator can receive the first service primitive from the MAP ~~–~~ Protocol Machine. ~~Depending on the received primitive,~~ The HLR creates an instance of the appropriate ~~user~~ process ~~is created~~ as follows:

- if the HLR receives a MAP_SEND_ROUTING_INFO_FOR_SM indication ~~is received~~, it creates an instance of the process Mobile_Terminated_SM_HLR ~~is created~~;
- if the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication ~~is received~~, it creates an instance of the process Report_SM_delivery_stat_HLR ~~is created~~.

After it has created~~ion~~ the instance of the user process, the Co-ordinator relays the messages between the MAP ~~–~~ Protocol Machine and the ~~invoked~~ child process until ~~a request or an indication for~~the dialogue ~~termination~~ is terminated~~received~~.

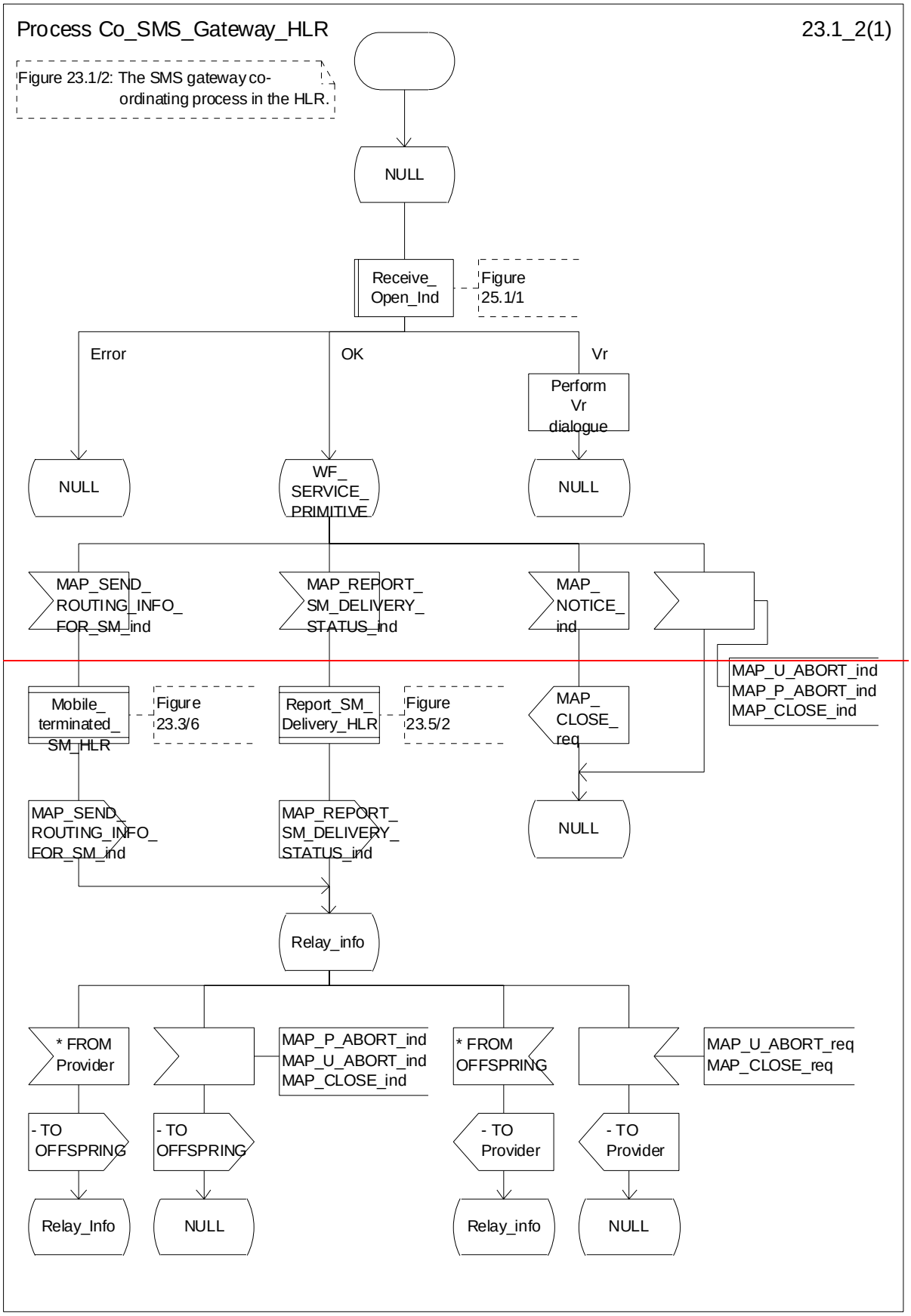
The SM Gateway Co-ordinator process in the HLR is shown in ~~the~~ figure 23.1/2.

If the Receive_Open_Ind macro takes the Vr exit then HLR shall perform the MAP ~~Vr~~ dialogue as specified for the appropriate application context version. ~~But based~~ Depending on the subscriber data, handling at the MAP user application level may be performed as ~~described in~~ specified in subclauses 23.3.2 and 23.5.1 of the present document~~release 97~~:

~~— If the subscriber is not a GPRS subscriber then the behaviour of the HLR shall be the same as described in the corresponding MAP Vr release.~~

~~— If the subscriber is a GPRS subscriber and a non GPRS subscriber with the option « transfer of SM via the MSC when GPRS is not supported in the GMSC » then the behaviour of the HLR shall be the same as described in the corresponding MAP Vr release.~~

~~— If the subscriber is a GPRS subscriber and a non GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only then the behaviour of the HLR shall be the same as for the case transfer over GPRS described in MAP release 97, with the following precision: because GMSC does not support MAP release 97, the previous MAP protocol release is used. When the HLR sends the MAP_SEND_ROUTING_INFO_FOR_SM_Resp, the SGSN number is mapped to the MAP parameter « MSC number ». When the HLR sends the MAP_INFORM_SERVICE_CENTRE_resp, the MNRG status shall be mapped to the MAP parameter « mnrf set ». When the HLR receives the MAP_REPORT_SM_DELIVERY_STATUS_Ind, it shall interpret the delivery outcome as a GPRS delivery outcome.~~


Process Co_SMS_Gateway_HLR
23.1_2(1)
Figure 23.1/2: The SMS gateway co-ordinating process in the HLR.
NULL
Receive_ Open_Ind
Figure 25.1/1
Error
OK
Vr
Perform Vr dialogue
NULL
WF_ SERVICE_ PRIMITIVE
NULL
MAP_SEND_ ROUTING_INFO_ FOR_SM_ind
MAP_REPORT_ SM_DELIVERY_ STATUS_ind
MAP_ NOTICE_ ind
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
Mobile_ terminated_ SM_HLR
Figure 23.3/6
Report_SM_ Delivery_HLR
Figure 23.5/2
MAP_ CLOSE_ req
NULL
MAP_SEND_ ROUTING_INFO_ FOR_SM_ind
MAP_REPORT_ SM_DELIVERY_ STATUS_ind
Relay_info
* FROM Provider
MAP_P_ABORT_ind
MAP_U_ABORT_ind
MAP_CLOSE_ind
* FROM OFFSPRING
MAP_U_ABORT_req
MAP_CLOSE_req
- TO OFFSPRING
- TO OFFSPRING
- TO Provider
- TO Provider
Relay_Info
NULL
Relay_info
NULL

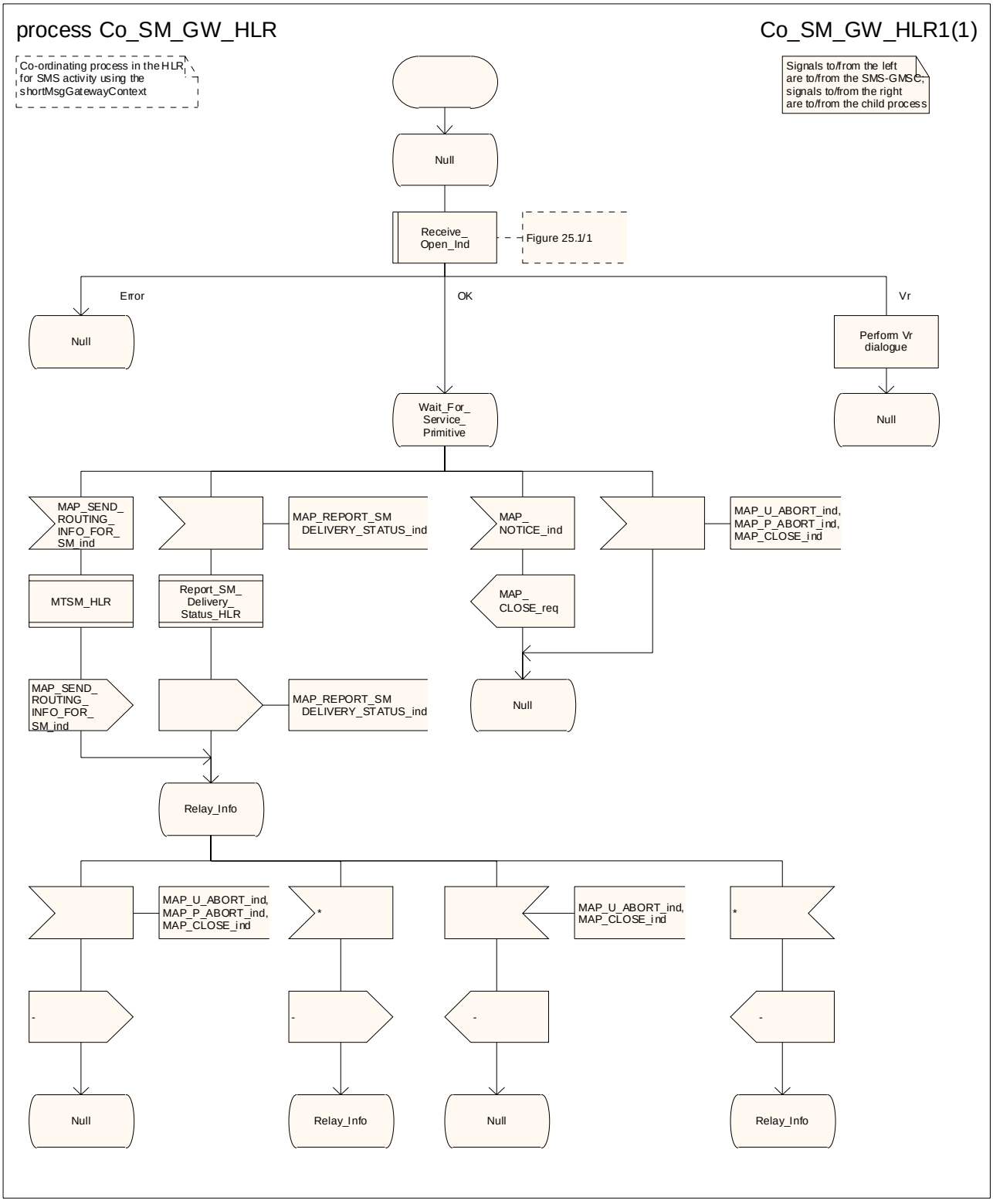


Figure 23.1/2: Process Co_SM~~S~~_Gateway_HLR

~~23.1.3 Mobile originated short message service Co-ordinator for the SGSN~~

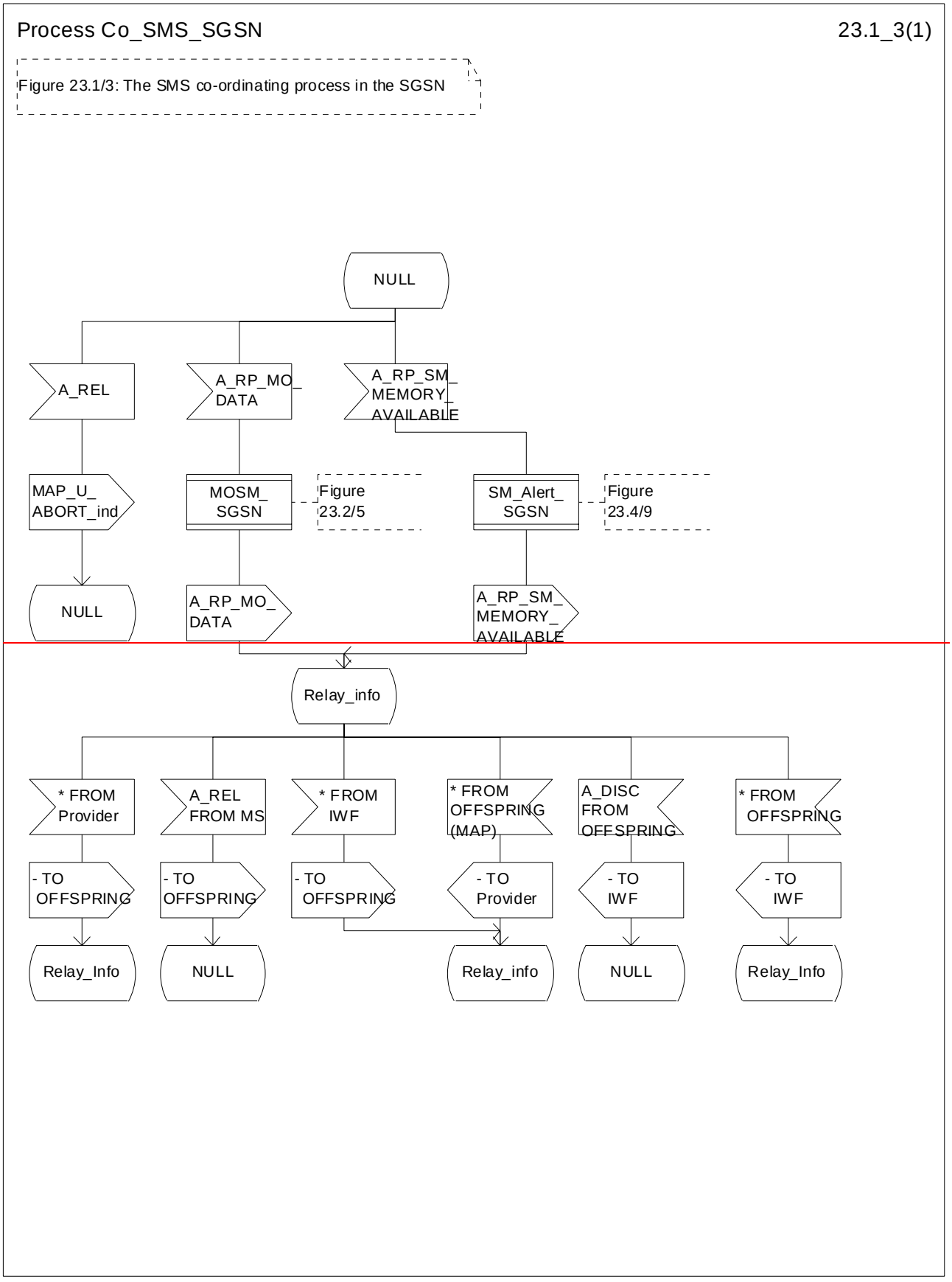
~~The MS initiates mobile originated short message transfer or alerting indication. Depending on the situation, the appropriate process is initiated as follows:~~

- ~~if the A_RP_MO_DATA indication is received, the process MOSM_SGSN is initiated (see clause 23.2.4);~~

- if the A_RP_SM_MEMORY_AVAILABLE indication is received, the process SC_Alert_SGSN is initiated (see clause 23.4.5).

After creation of the user process the Co-ordinator relays the messages between the SGSN and the MS, and the invoked process until a request or an indication for dialogue termination is received.

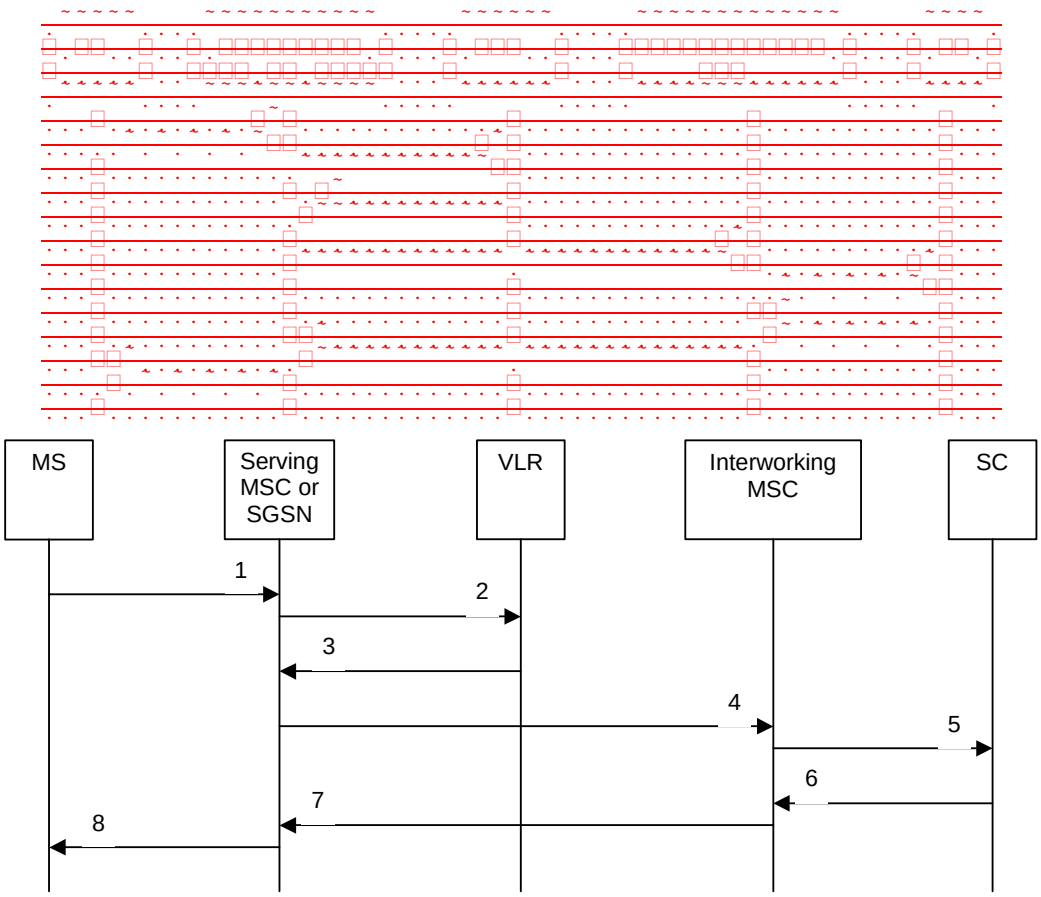
The SMS process Co-ordinator is shown in the figure 23.1/3.



~~Figure 23.1/3: Process Co_SMS_SGSN~~

23.2 The mobile originated short message transfer procedure

The mobile originated short message service procedure is used to forward a short message from a mobile subscriber to a Service Centre. The message flow for the mobile originated short message service procedure is shown in figure 23.2/1.



1) Short Message (3GPP TS 24.011 [37]).
2) MAP_SEND_INFO_FOR_MO_SMS (*).
3) MAP_SEND_INFO_FOR_MO_SMS_ACK (*).
4) MAP_MO_FORWARD_SHORT_MESSAGE.
5) Short message (3GPP TS 23.040).
6) Short message Acknowledgement (3GPP TS 23.040).
7) MAP_MO_FORWARD_SHORT_MESSAGE_ACK.
8) Short Message Acknowledgement (3GPP TS 24.011 [37]).
(*) Messages 2) and 3) are not used by the SGSN.

Figure 23.2/1: Mobile originated short message transfer

In addition the following MAP services are used:

MAP_PROCESS_ACCESS_REQUEST	(see subclause 8.3); (*)
MAP_AUTHENTICATE	(see subclause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see subclause 8.6); (*)
MAP_PROVIDE_IMSI	(see subclause 8.9); (*)
MAP_CHECK_IMEI	(see subclause 8.7);
MAP_FORWARD_NEW_TMSI	(see subclause 8.9); (*)
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see subclause 9.1); (*)
MAP_READY_FOR_SM	(see subclause 12.4).

(*) Th~~e~~ose messages are not used by the SGSN.

23.2.1 Procedure in the serv~~ic~~ing MSC

~~The activation of the MAP_PROCESS_ACCESS_REQUEST service is described in the clause 25.4.1.~~

Any CAMEL-specific handling defined in this subclause is omitted if the MSC does not support CAMEL control of MO SMS, or if the subscriber ~~is not a~~does not have a subscription for CAMEL ~~subscriber~~control of MO SMS.

When the MSC receives~~ing~~ the short message from the A-interface, ~~the MSC~~it sends ~~the~~ a MAP_SEND_INFO_FOR_MO_SMS request to the VLR and waits for a response. While the MSC is waiting for the response from the VLR:

~~- if it receives a Release indication from the A-interface, it aborts the dialogue with the VLR, and the process terminates;~~

- if the VLR aborts or prematurely closes the dialogue, the MSC sends an A_RP_ERROR with error cause "Network out of order" to the MS, and the process terminates;

- ~~As a response~~if ~~the MSC~~ it~~will~~ receives ~~the~~ a MAP_SEND_INFO_FOR_MO_SMS confirmation from the VLR, it checks the confirmation.~~indicating that:~~

~~- the service ends successfully. If the MSC is not itself the IWMSC, the short message transmission towards the IWMSC is initiated using the MAP_MO_FORWARD_SHORT_MESSAGE request;~~

  - if the confirmation includes an error, the MSC sends an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;~~service ends unsuccessfully. The error cause in the MAP_SEND_INFO_FOR_MO_SMS confirmation indicates the reason for the unsuccessful end. The mapping between MAP error causes and RP_ERROR causes is described in 3GPP TS 23.140.~~

  - if the confirmation indicates a successful outcome, the MSC calls the procedure CAMEL_O_SMS_INIT and tests the result.

    - if the result was "SMS_Aborted", the process terminates;

    - if the result was "Release_SMS", the MSC returns an A_RP_ERROR with an error cause as instructed by the gsmSCF to the MS, and the process terminates;

    - if the result was "Redirect SMS", the MSC modifies the data for the submitted short message as instructed by the gsmSCF, and the MSC handling continues;

    - if the result was "Continue", the MSC handling continues.

  - the MSC checks whether Operator Determined Barring would prevent the submission of the short message.

    - if Operator Determined Barring would prevent the submission of the short message, the MSC returns an A_RP_ERROR with error cause "Operator determined barring" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates;

    - if Operator Determined Barring would not prevent the submission of the short message, the MSC handling continues.

  - the MSC checks whether SS barring would prevent the submission of the short message.

    - if SS barring would prevent the submission of the short message, the MSC returns an A_RP_ERROR with error cause "Call barred" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates;

    - if SS barring would not prevent the submission of the short message, the MSC handling continues.

  - if the MSC is separate from the SMS-IWMSC, MSC handling continues as described below under the heading "Serving MSC is separate from SMS-IWMSC".

  - if the MSC is also the SMS-IWMSC, the MSC handling continues as described below under the heading "Serving MSC is SMS-IWMSC";

Serving MSC is separate from SMS-IWMSC

The MSC checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.

- if the two requests can be grouped in a single TC message, the MSC requests a dialogue with the SMS-IWMSC, including the MAP_MO_FORWARD_SHORT_MESSAGE request;
  - if the dialogue opening is successful, the MSC waits for the response from the SMS-IWMSC;
  - if the macro Receive_Open_Cnf takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol and the process terminates;
  - if the macro Receive_Open_Cnf takes the "Error" exit, the MSC returns an A_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates.
- if the two requests cannot be grouped in a single TC message, the MSC requests a dialogue with the SMS-IWMSC, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;
  - if the dialogue opening is successful, the MSC sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the SMS-IWMSC, and waits for the response from the SMS-IWMSC;
  - if the macro Receive_Open_Cnf takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol, and the process terminates;
  - if the macro Receive_Open_Cnf takes the "Error" exit, the MSC returns an A_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates.
- if the MSC receives a MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the SMS-IWMSC, it checks the content of the confirmation;
  - if the confirmation indicates that the submission of the short message was successful, the MSC returns an A_RP_ACK to the MS and reports to the gsmSCF that the short message submission was successful, and the process terminates;
  - if the confirmation indicates that the submission of the short message failed, the MSC returns an A_RP_ERROR with the appropriate error cause to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates;
- ~~if the MSC receives a Release indication from the A-interface, it aborts the dialogue with the SMS-IWMSC and reports to the gsmSCF that the short message submission has failed, and the process terminates;~~
- if the dialogue with the SMS-IWMSC fails, the MSC returns an A_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates.

Serving MSC is SMS-IWMSC

The MSC sends an SC_RP_MO_DATA request to the Short Message Service Centre (SMSC), and waits for the response.

- ~~if the MSC receives a Release indication from the A-interface, it aborts the dialogue with the SMSC and reports to the gsmSCF that the short message submission has failed, and the process terminates;~~
- if the MSC receives an error response from the SMSC, it returns an A_RP_ERROR with the appropriate error cause to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates;
- if the SMSC aborts the dialogue, the MSC returns an A_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process terminates;
- if the MSC receives a positive response from the SMSC, it returns an A_RP_ACK to the MS and reports to the gsmSCF that the short message submission was successful, and the process terminates.

~~If there are data errors in the MAP_SEND_INFO_FOR_MO_SMS confirmation, or there is an operation failure in MAP, the RP_ERROR cause network out of order is forwarded to the mobile station.~~

~~The MSC opens a CAMEL dialogue as specified in 3GPP TS 23.078. If the CAMEL service bars the MO SM then the failure is reported to MS.~~

~~The MSC checks the barring as follows;~~

- ~~if the short message transfer would contravene operator determined barring, the failure is reported to the CAMEL service as specified in 3GPP TS 23.078 and the call barred error with cause operator barring is returned to MS;~~

- ~~if the short message transfer would contravene the supplementary service call barring conditions, the failure is reported to the CAMEL service as specified in 3GPP TS 23.078 and the call barred error with cause barring service active is returned to MS.~~

~~If the service MAP_MO_FORWARD_SHORT_MESSAGE is started, the MSC will check whether the grouping of MAP_OPEN request and MAP_MO_FORWARD_SHORT_MESSAGE request needs segmentation. If this is the case then the MAP_OPEN request primitive shall be sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MO_FORWARD_SHORT_MESSAGE request is sent. As a response to the procedure, the servicing MSC will receive the MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the IWMSC indicating that:~~

- ~~the short message has been successfully delivered to the Service Centre. The successful submission of SM is reported to the CAMEL service as specified in 3GPP TS 23.078 and the acknowledgement is sent to the mobile station;~~

- ~~one of several error cases has occurred. The mapping between MAP error causes and RP_ERROR causes is described in 3GPP TS 23.140. The failure in the SM submission is reported to the CAMEL service as specified in 3GPP TS 23.078 and the appropriate indication is provided to the mobile station.~~

~~If the procedure failed, a provider error or an abort indication is received. The RP_ERROR cause network out of order is provided to the mobile station.~~

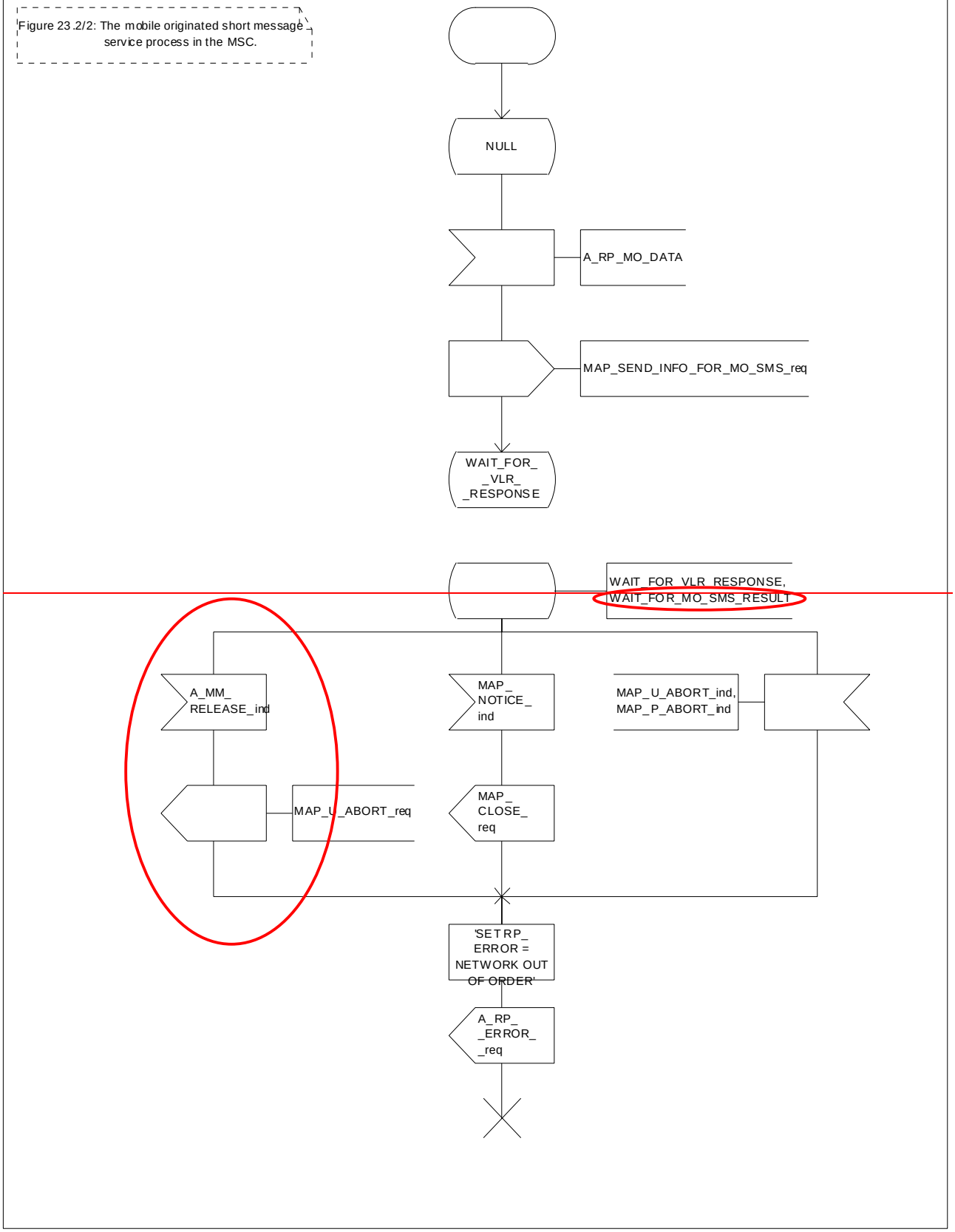
~~If the MSC itself is the interworking MSC, the short message is forwarded to the Service Centre. In that case the service MAP_MO_FORWARD_SHORT_MESSAGE is not initiated. The acknowledgement message from the Service Centre is forwarded to the mobile station (3GPP TS 23.140, 3GPP TS 24.011 [37]).~~

The mobile originated short message service proces~~sdure~~ in the MSC is shown in figure 23.2/2.

CR editor's note: the ordering of the material in the SDL diagrams has been changed to reflect better the sequence of handling. The material on the old sheet 3 and some of the material on the old sheet 1 are on the new sheet 4; the material on the old sheet 4 is on the new sheet 3.

Process MOSM_MSC 23.2_2.1(3)

Figure 23.2/2: The mobile originated short message service process in the MSC.



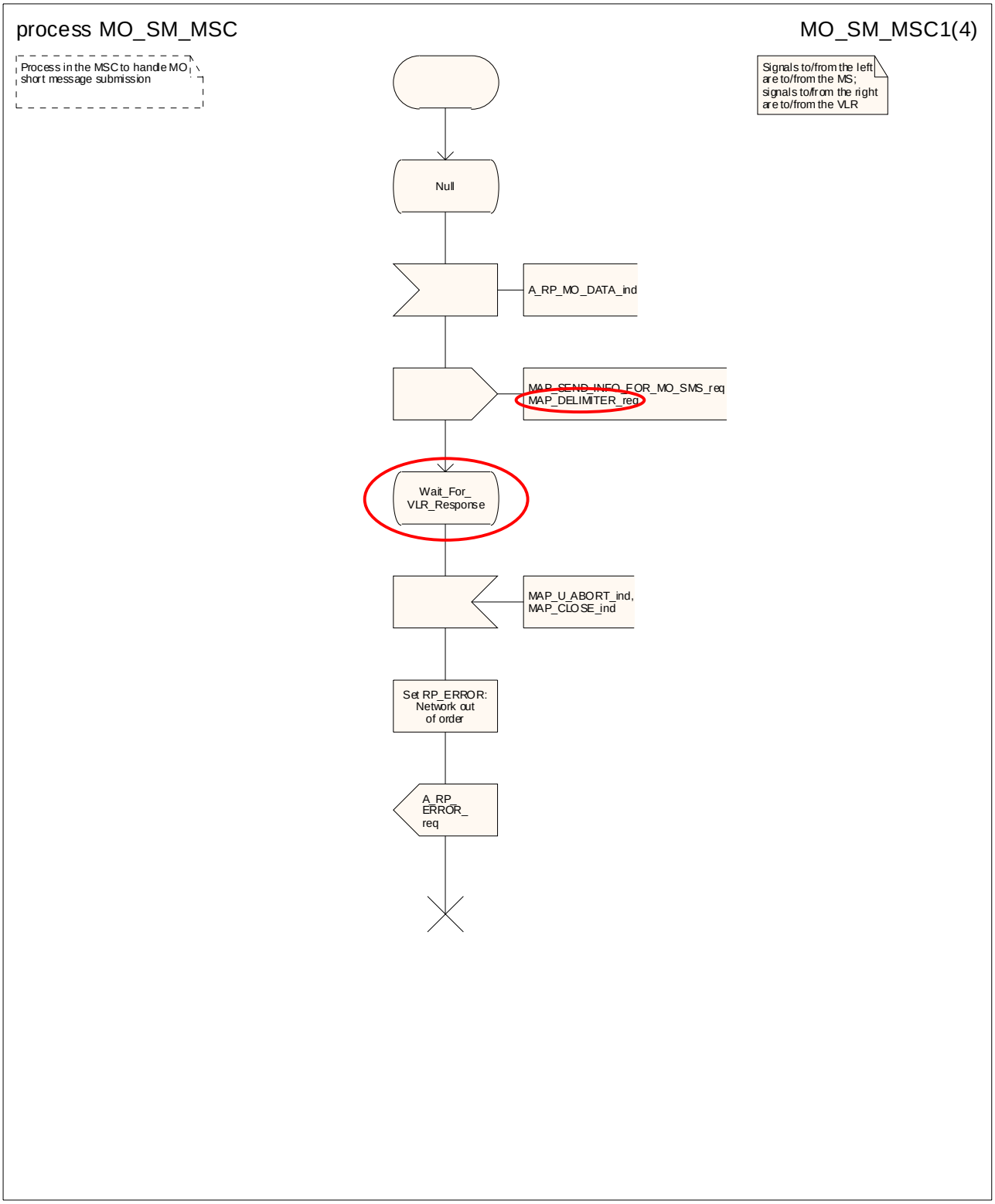
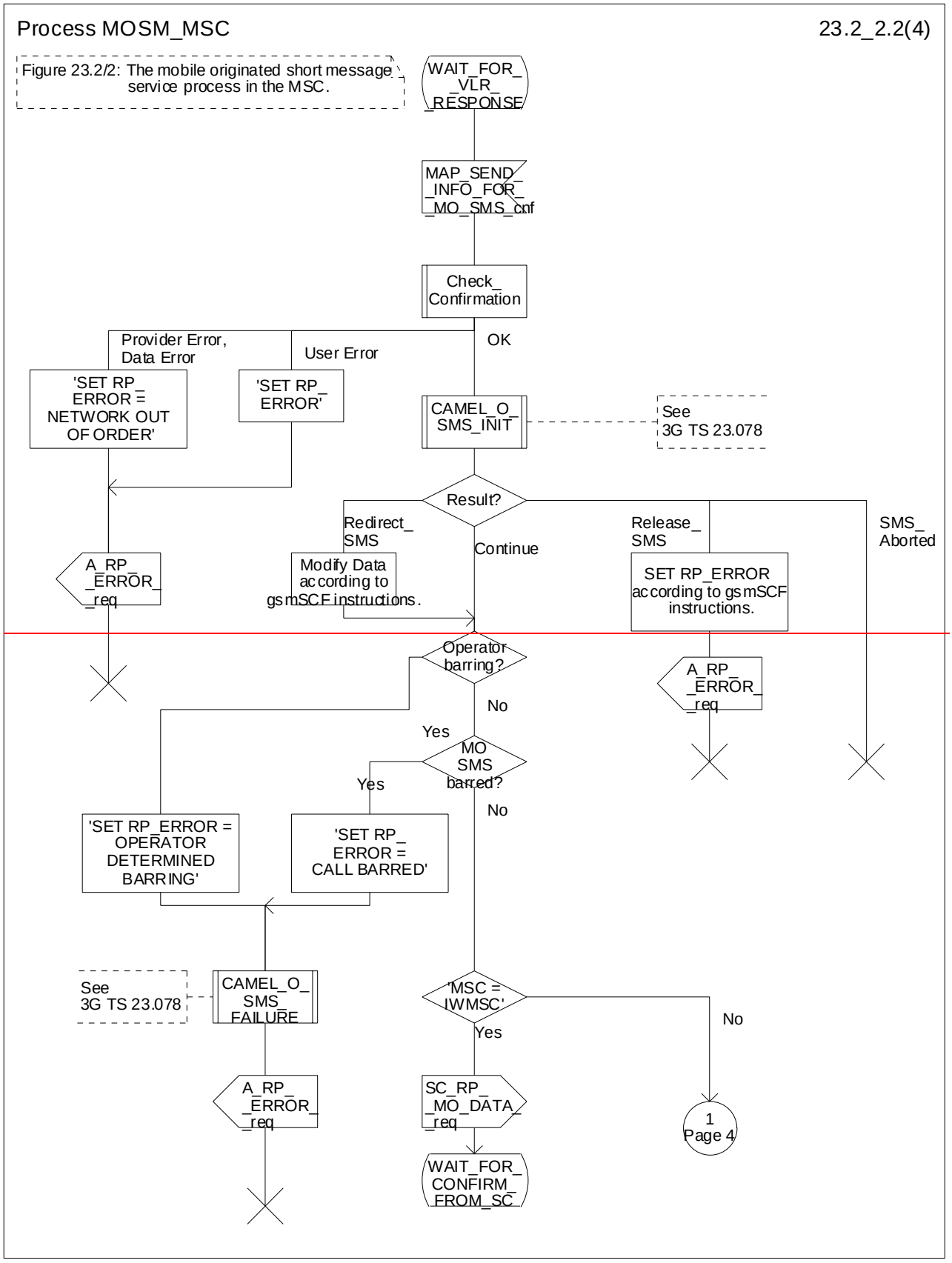


Figure 23.2/2 (sheet 1 of 4): Process MO_SM_MSC


Process MOSM_MSC
23.2_2.2(4)
Figure 23.2/2: The mobile originated short message service process in the MSC.
WAIT_FOR_VLR_RESPONSE
MAP_SEND_INFO_FOR_MO_SMS_cnf
Check_Confirmation
Provider Error, Data Error
User Error
OK
'SET RP_ERROR = NETWORK OUT OF ORDER'
'SET RP_ERROR'
CAMEL_O_SMS_INIT
See 3G TS 23.078
Result?
Redirect_SMS
Continue
Release_SMS
SMS_Aborted
A_RP_ERROR_req
Modify Data according to gsmSCF instructions.
SET RP_ERROR according to gsmSCF instructions.
Operator barring?
No
Yes
MO SMS barred?
Yes
No
'SET RP_ERROR = OPERATOR DETERMINED BARRING'
'SET RP_ERROR = CALL BARRED'
See 3G TS 23.078
CAMEL_O_SMS_FAILURE
'MSC = IWMSC'
No
Yes
A_RP_ERROR_req
SC_RP_MO_DATA_req
1 Page 4
WAIT_FOR_CONFIRM_FROM_SC

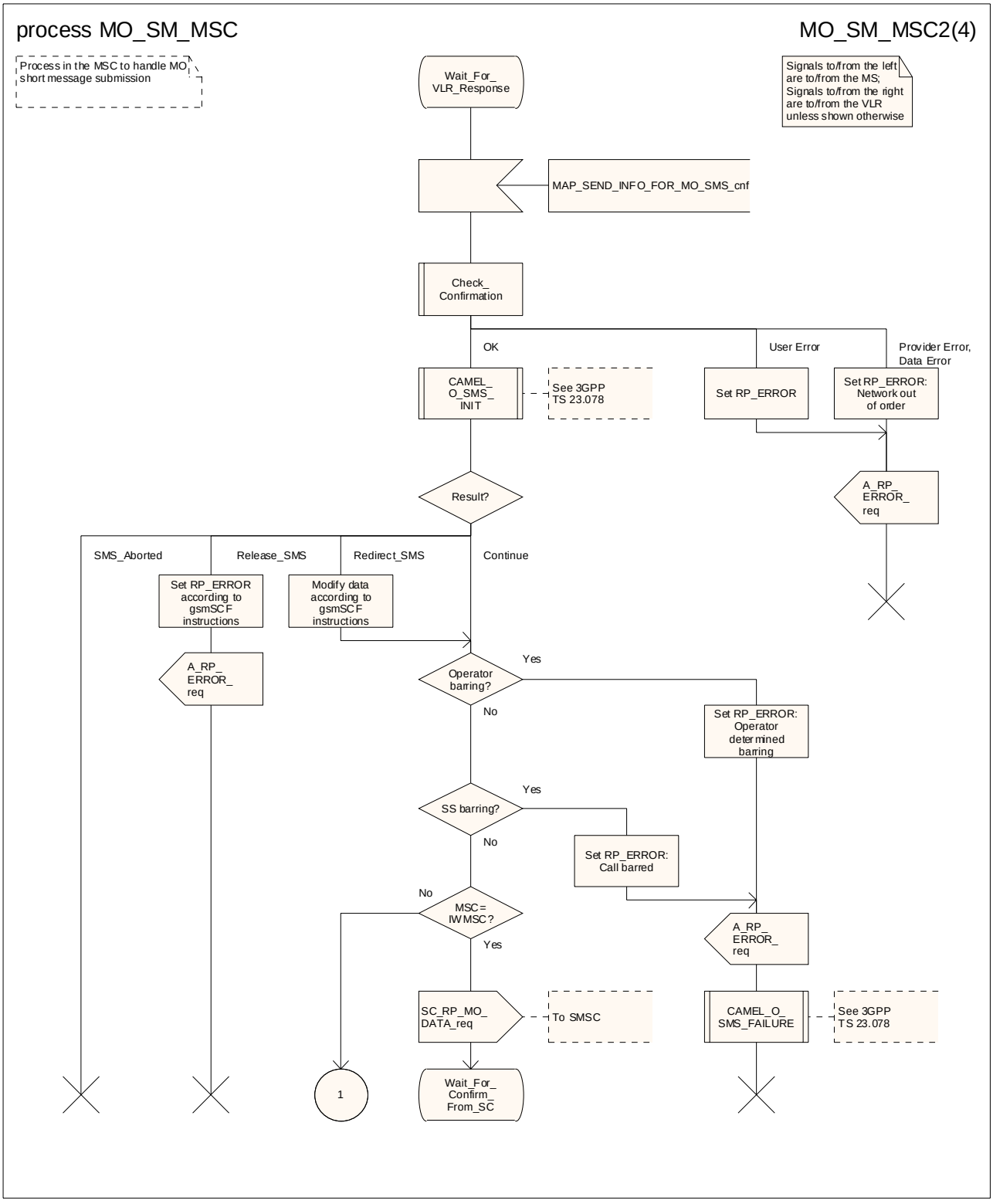
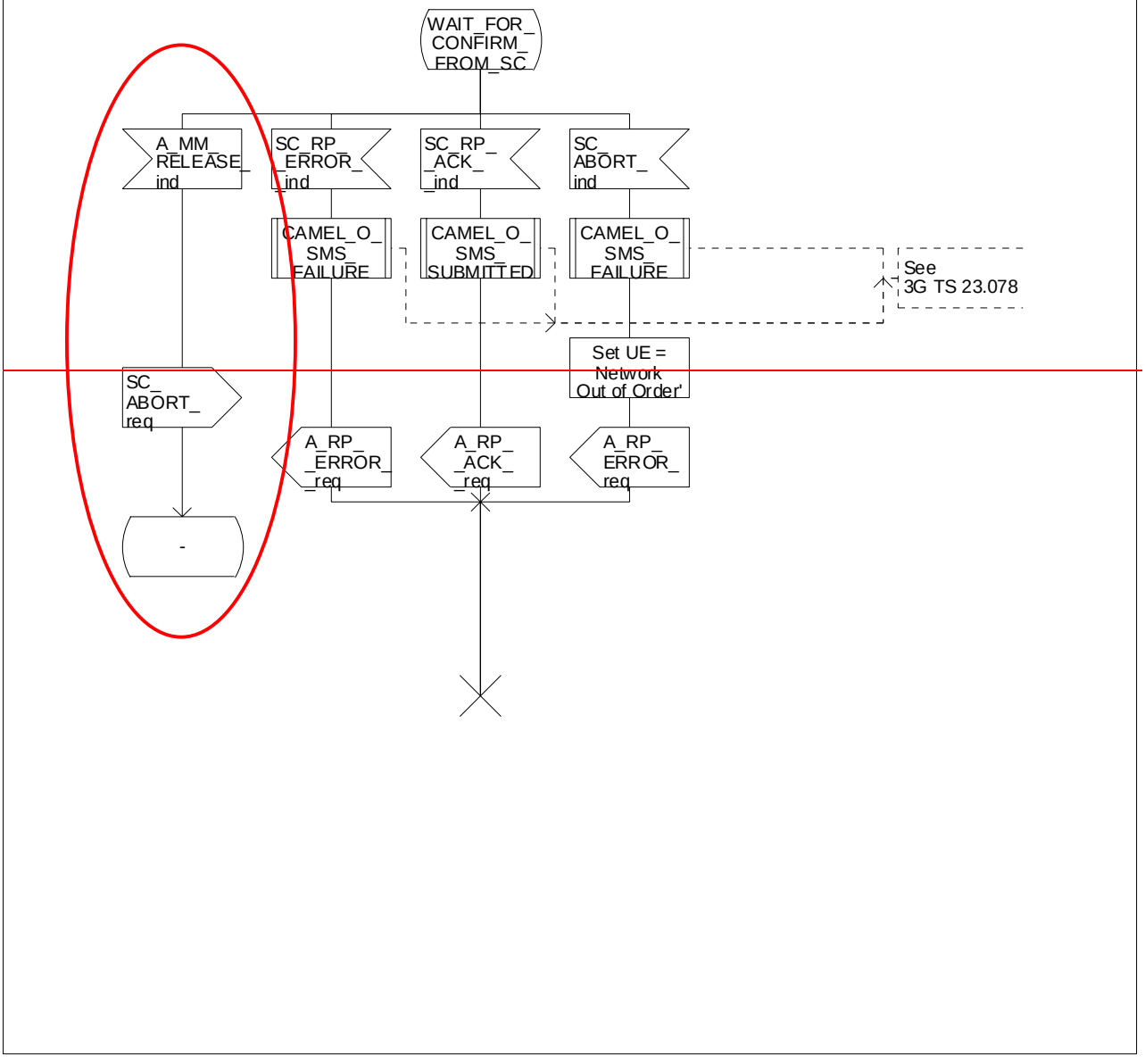


Figure 23.2/2 (sheet 2 of 4): Process MO_SM_MSC

Process MOSM_MSC 23.2_2.new3(4)

Figure 23.2/2: The mobile originated short message service process in the MSC.



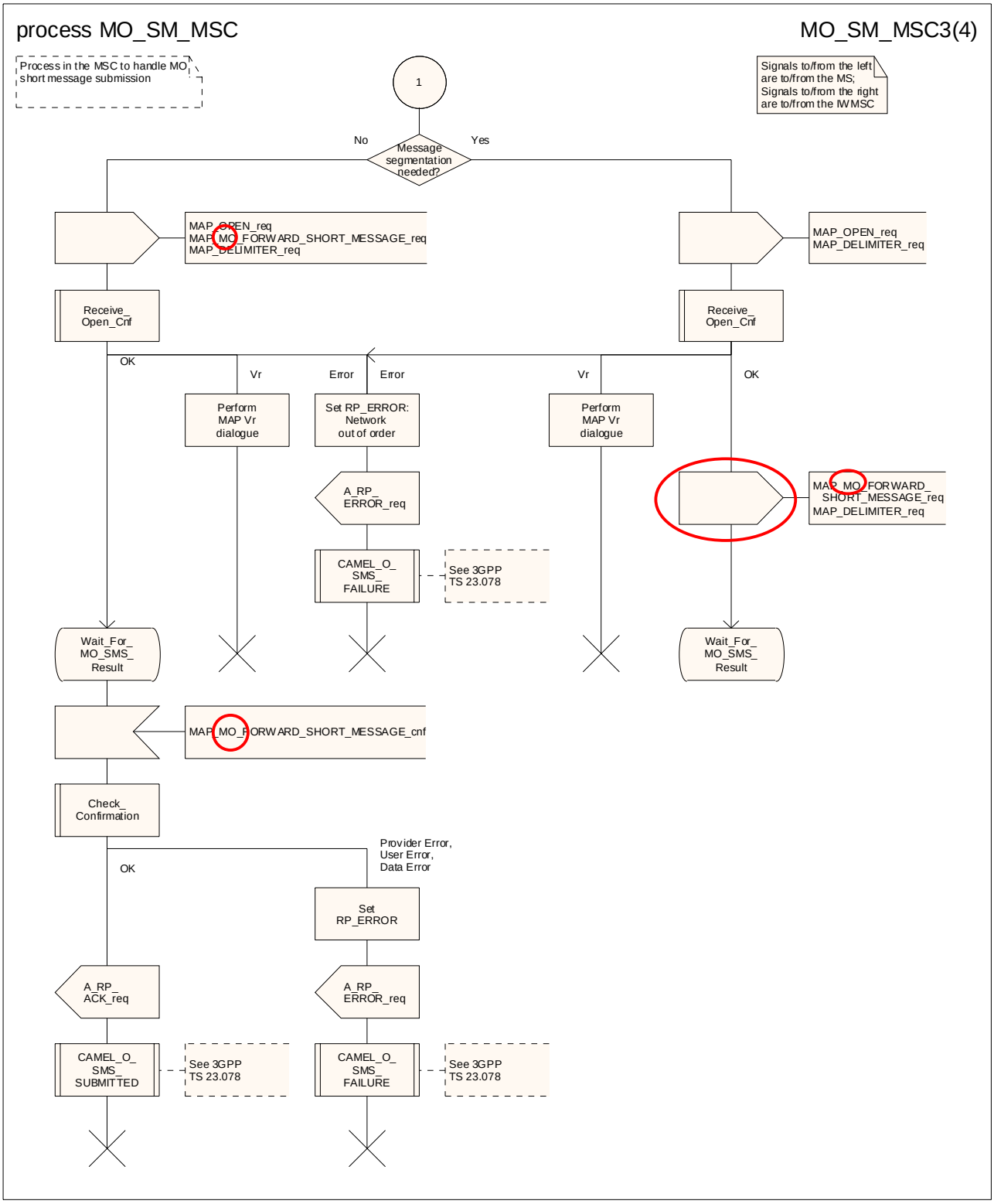
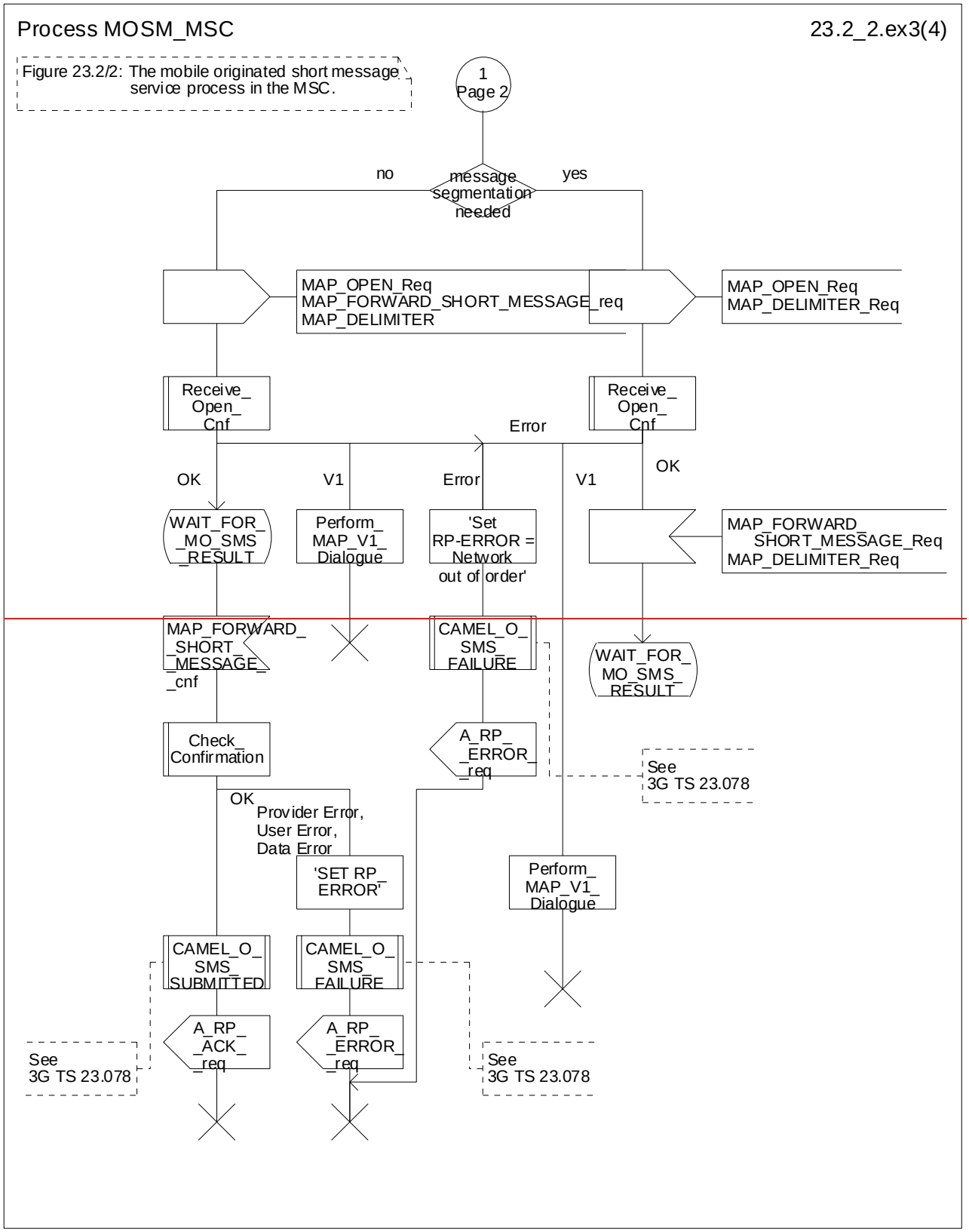


Figure 23.2/2 (sheet 3 of 4): Process MO_SM_MSC


Process MOSM_MSC
23.2_2.ex3(4)
Figure 23.2/2: The mobile originated short message service process in the MSC.
1
Page 2
no
message segmentation needed
yes
MAP_OPEN_Req
MAP_FORWARD_SHORT_MESSAGE_req
MAP_DELIMITER
MAP_OPEN_Req
MAP_DELIMITER_Req
Receive_ Open_ Cnf
Receive_ Open_ Cnf
Error
OK
V1
Error
V1
OK
WAIT_FOR_ _MO_SMS _RESULT
Perform_ MAP_V1_ Dialogue
'Set RP-ERROR = Network out of order'
MAP_FORWARD_ SHORT_MESSAGE_Req
MAP_DELIMITER_Req
MAP_FORWARD_ _SHORT_ _MESSAGE_ _cnf
CAMEL_O_ SMS_ FAILURE
WAIT_FOR_ MO_SMS_ RESULT
Check_ Confirmation
A_RP_ _ERROR_ _req
See 3G TS 23.078
OK
Provider Error, User Error, Data Error
'SET RP_ ERROR'
Perform_ MAP_V1_ Dialogue
CAMEL_O_ SMS_ SUBMITTED
CAMEL_O_ SMS_ FAILURE
A_RP_ _ACK_ _req
A_RP_ _ERROR_ _req
See 3G TS 23.078
See 3G TS 23.078

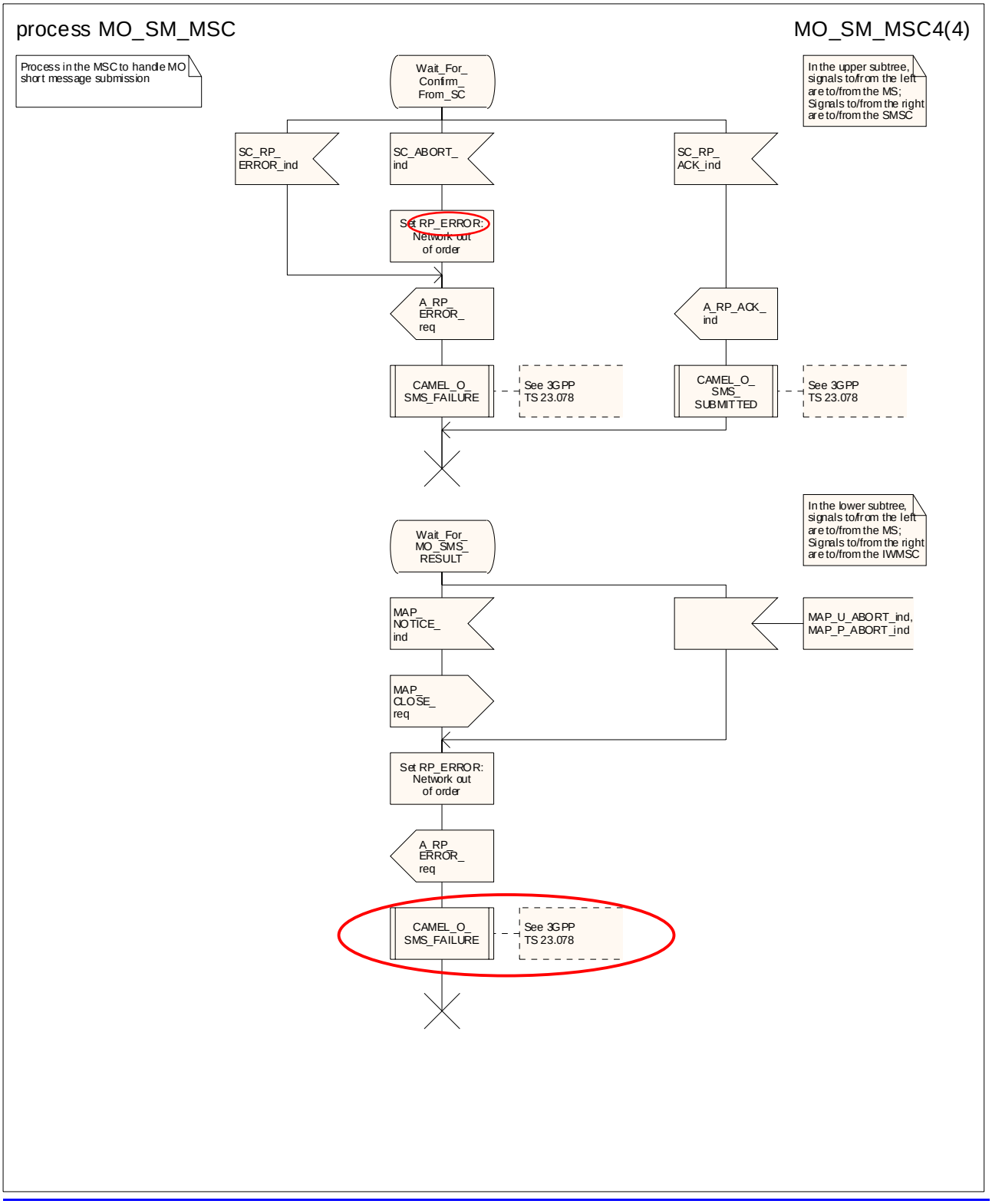


Figure 23.2/2 (sheet 4 of 4): Process MO_SM_MSC

23.2.2 Procedure in the VLR

The process is triggered by a dialogue opening request followed by a MAP_PROCESS_ACCESS_REQUEST including a CM service type Short Message Service.

If the macro Process_Access_Request_VLR takes the "OK" exit, the VLR waits for a MAP_SEND_INFO_FOR_MO_SMS indication from the MSC.

- If the MSC aborts the dialogue, the process returns to the Null state;
- if the indication is badly formed, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the appropriate user error;
- if the indication is OK, the VLR checks whether the submission of the short message is allowed
  - if MO SMS is not provisioned, VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Teleservice not provisioned";
  - if the submission of the short message is prevented by Operator Determined Barring, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Operator barring";
  - if the submission of the short message is prevented by the Barring supplementary service, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Barring service active";
  - if the submission of the short message is allowed, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the MSISDN of the requesting subscriber.~~;~~

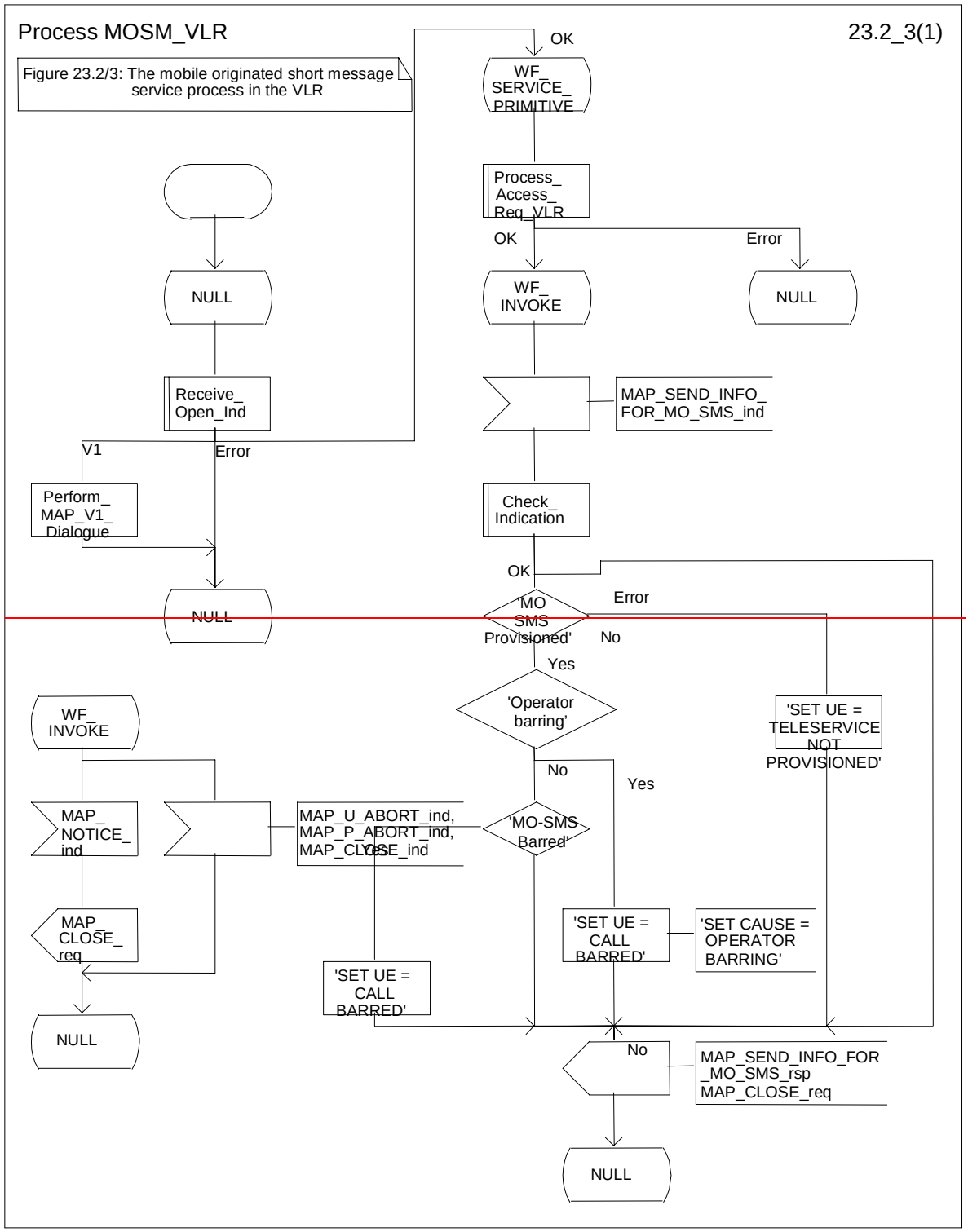
When the VLR has returned the MAP_SEND_INFO_FOR_MO_SMS response, the process returns to the Null state.

~~The MAP_PROCESS_ACCESS_REQUEST indication starts the MAP_PROCESS_ACCESS_REQUEST service in the VLR. The application context in the MAP_OPEN indication is mobile originated short message transfer.~~

~~If the service MAP_PROCESS_ACCESS_REQUEST is successful, the VLR waits for the next message from the MSC. When receiving the MAP_SEND_INFO_FOR_MO_SMS indication, the VLR acts as follows:~~

- ~~if there is incompatibility in the subscription check, the error teleservice not provisioned is returned to the MSC;~~
- ~~if the short message transfer would contravene Operator determined Barring , the call barred error with cause operator barring is returned;~~
- ~~if the short message transfer would contravene the supplementary service call barring conditions in the VLR, the call barred error with cause barring service active is returned.~~

~~When the mobile subscriber has passed all checks, the MAP_SEND_INFO_FOR_MO_SMS response is initiated and the procedure is terminated in the VLR.~~ The mobile originated short message transfer proces[ss]~~dure~~ in the VLR is shown in figure 23.2/3.


Process MOSM_VLR
23.2_3(1)
Figure 23.2/3: The mobile originated short message service process in the VLR
NULL
Receive_ Open_Ind
V1
Error
Perform_ MAP_V1_ Dialogue
NULL
OK
WF_ SERVICE_ PRIMITIVE
Process_ Access_ Req_VLR
OK
Error
WF_ INVOKE
NULL
MAP_SEND_INFO_ FOR_MO_SMS_ind
Check_ Indication
OK
'MO SMS Provisioned'
Error
No
Yes
'Operator barring'
No
Yes
'SET UE = TELESERVICE NOT PROVISIONED'
'MO-SMS Barred'
'SET UE = CALL BARRED'
'SET CAUSE = OPERATOR BARRING'
No
MAP_SEND_INFO_FOR _MO_SMS_rsp
MAP_CLOSE_req
NULL
WF_ INVOKE
MAP_ NOTICE_ ind
MAP_U_ABORT_ind, MAP_P_ABORT_ind, MAP_CLOSE_ind
MAP_ CLOSE_ req
'SET UE = CALL BARRED'
NULL

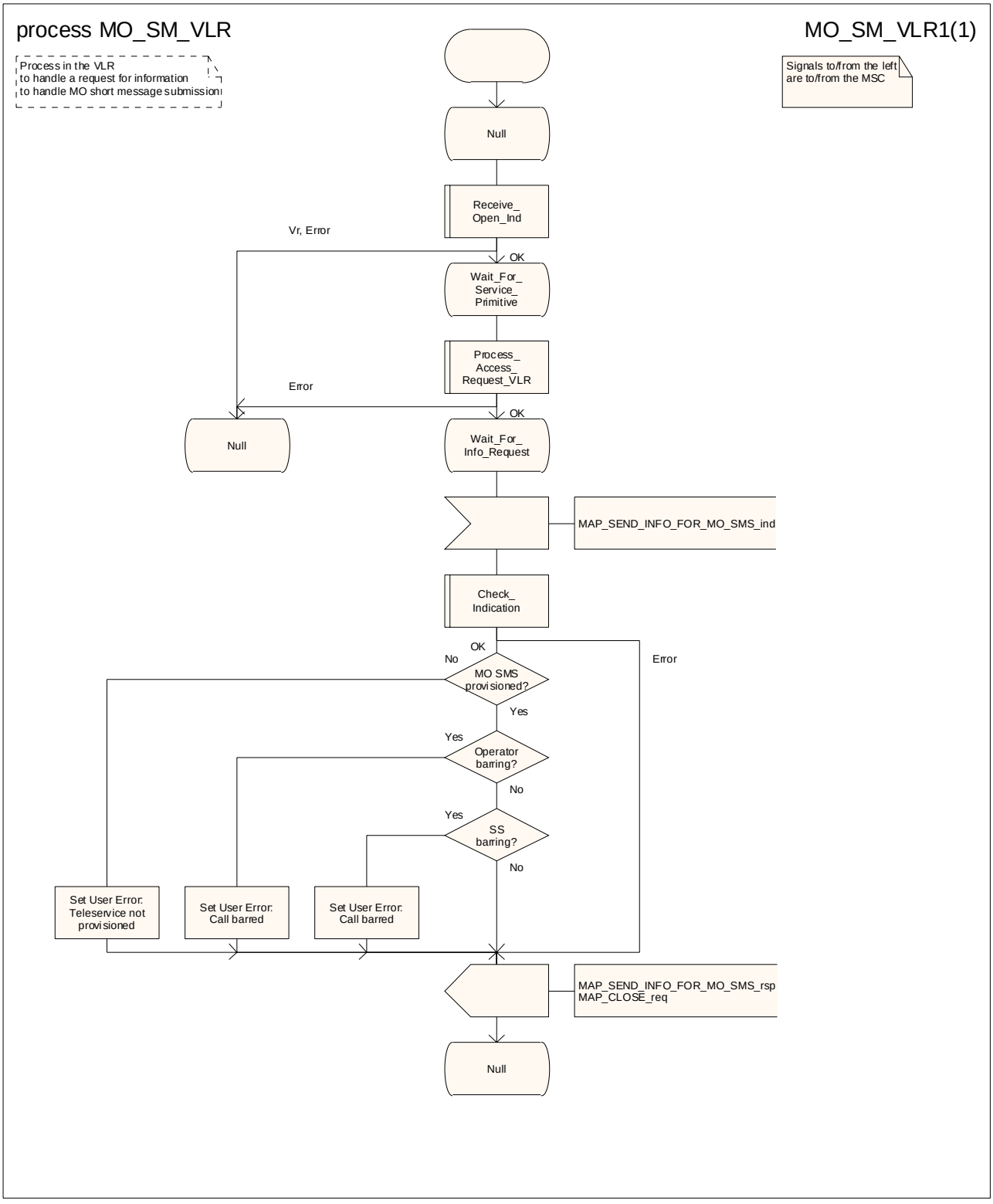


Figure 23.2/3: Process MO_SM_VLR

23.2.3 Procedure in the SMS ~~i~~Interworking MSC (SMS-IWMSC)

This procedure applies only when the SMS-IWMSC is not integrated with the serv~~ic~~ing MSC or SGSN.

The process is triggered by a dialogue opening request with the application context shortMsgMO-RelayContext.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the SMS-IWMSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the SMS-IWMSC waits for a service primitive.
  - if the dialogue with the MSC fails, the process returns to the Null state;
  - if the next primitive received is a MAP_DELIMITER indication, the SMS-IWMSC returns a MAP_DELIMITER request, and waits for a service primitive;
  - if the next primitive received is a MAP_MO_FORWARD_SHORT_MESSAGE indication, the SMS-IWMSC checks the indication.
    - if the indication is badly formed, the SMS-IWMSC returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the appropriate user error and the process returns to the Null state;
    - if the indication is OK, the SMS-IWMSC checks whether the service centre is known.
      - if the service centre is not known, the SMS-IWMSC returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the user error "SM delivery failure" with delivery failure cause "Unknown service centre" and the process returns to the Null state;
      - if the service centre is known, the SMS-IWMSC sends an SC_RP_MO_DATA request to the service centre, and waits for the response.
        - if the MAP dialogue with the serving MSC fails, the SMS-IWMSC sends an SC_A~~S~~BORT request to the service centre and the process returns to the Null state;
        - if the SMS-IWMSC receives an error response from the service centre, it returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the user error "SM delivery failure" with delivery failure cause set according to the error response received from the service centre, and the process returns to the Null state;
        - if the SMS-IWMSC receives a positive acknowledgement from the service centre, it returns a MAP_MO_FORWARD_SHORT_MESSAGE response and the process returns to the Null state.

~~When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service-user in the interworking MSC issues a MAP_DELIMITER request primitive in order to trigger the local MAP service-provider to confirm the dialogue. Then a MAP_MO_FORWARD_SHORT_MESSAGE indication shall be received.~~

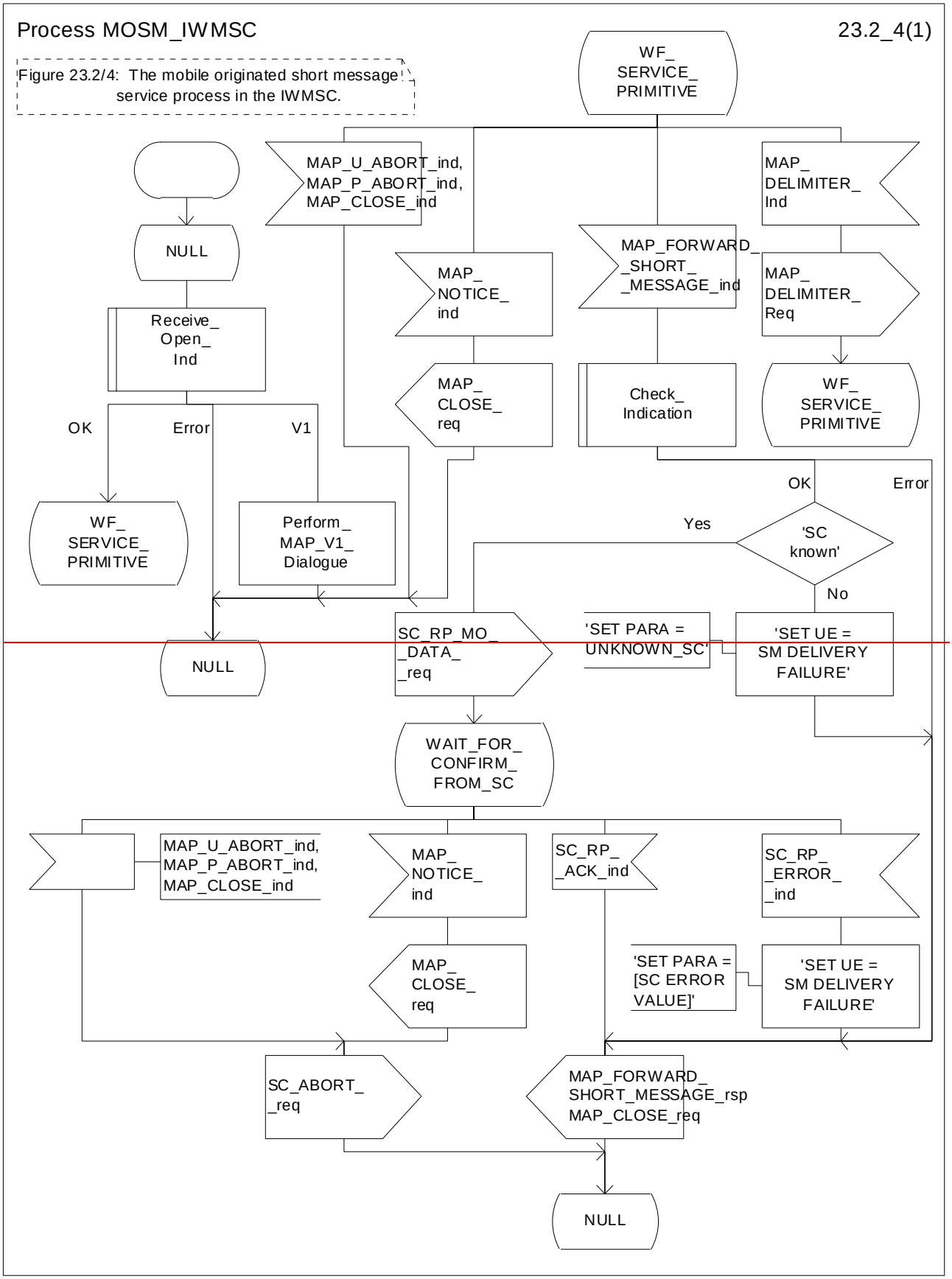
~~When a MAP_MO_FORWARD_SHORT_MESSAGE indication is correctly received, the Interworking MSC invokes forwarding of the short message to the Service Centre. If invalid data content is detected, an unexpected data value error or a data missing error is returned to the servicing MSC or SGSN.~~

~~The outcome of the procedure with the Service Centre is awaited before a MAP_MO_FORWARD_SHORT_MESSAGE response is given back to the servicing MSC or SGSN:~~

- ~~if a short message is accepted by the Service Centre, an acknowledgement is sent back to the servicing MSC or SGSN;~~
- ~~if the Service Centre is not identified, the SM Delivery Failure error is returned to the servicing MSC or SGSN;~~
- ~~if the Service Centre returns an error indication, the SM Delivery Failure error is returned to the servicing MSC with the error cause and any diagnostic information received from the Service Centre;~~

- ~~if the short message cannot be forwarded to the Service Centre or the procedure towards the Service Centre fails for some reason, a system failure error is sent to the servicing MSC or SGSN.~~

The mobile originated short message service transfer process in the SMS-IWMSC is shown in figure 23.2/4.


Process MOSM_IWMSC
23.2_4(1)
Figure 23.2/4: The mobile originated short message service process in the IWMSC.
WF_ SERVICE_ PRIMITIVE
MAP_U_ABORT_ind, MAP_P_ABORT_ind, MAP_CLOSE_ind
MAP_ DELIMITER_ Ind
NULL
MAP_ NOTICE_ ind
MAP_FORWARD_ _SHORT_ _MESSAGE_ind
MAP_ DELIMITER_ Req
Receive_ Open_ Ind
MAP_ CLOSE_ req
Check_ Indication
WF_ SERVICE_ PRIMITIVE
OK
Error
V1
OK
Error
Yes
'SC known'
No
WF_ SERVICE_ PRIMITIVE
Perform_ MAP_V1_ Dialogue
NULL
SC_RP_MO_ _DATA_ _req
'SET PARA = UNKNOWN_SC'
'SET UE = SM DELIVERY FAILURE'
WAIT_FOR_ CONFIRM_ FROM_SC
MAP_U_ABORT_ind, MAP_P_ABORT_ind, MAP_CLOSE_ind
MAP_ NOTICE_ ind
SC_RP_ _ACK_ind
SC_RP_ _ERROR_ _ind
MAP_ CLOSE_ req
'SET PARA = [SC ERROR VALUE]'
'SET UE = SM DELIVERY FAILURE'
SC_ABORT_ _req
MAP_FORWARD_ SHORT_MESSAGE_rsp MAP_CLOSE_req
NULL

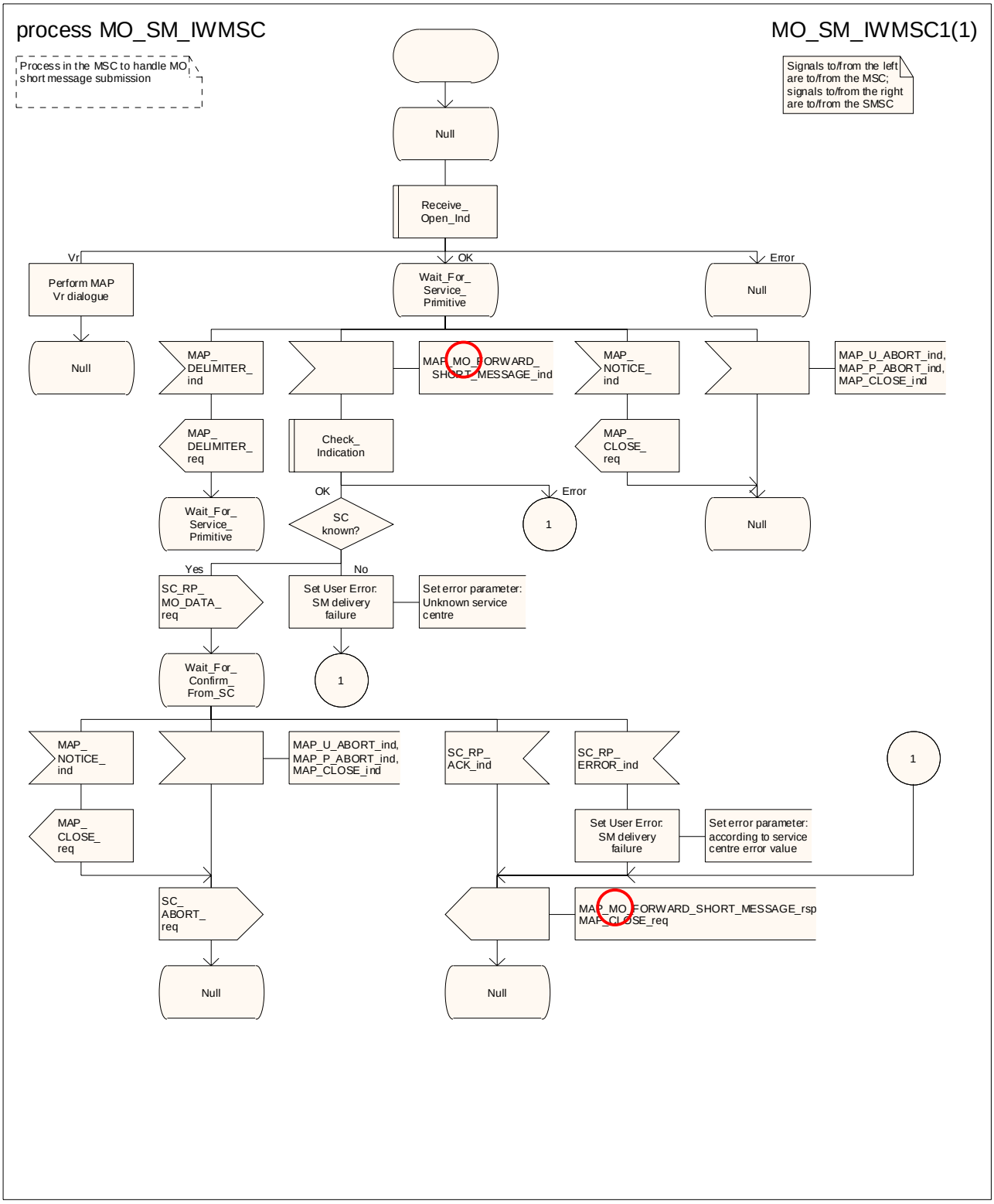


Figure 23.2/4: Process MO_SM_IWMSC

23.2.4 Procedure in the ~~servicing~~ SGSN

Any CAMEL-specific handling defined in this subclause is omitted if the SGSN does not support CAMEL control of MO SMS, or if the subscriber ~~is~~does not have a subscription for CAMEL control of MO SMS~~subscriber~~.

The process is triggered by a short message received from the MS over the Gb interface.

If the MO SMS service is not provisioned, the SGSN returns a Gb_RP_ERROR with error cause "Requested facility not subscribed", and the process returns to the Null state.

If the MO SMS service is provisioned, the SGSN calls the procedure CAMEL_O_SMS_INIT and tests the result.

- if the result was "SMS_Aborted", the process returns to the Null state;
- if the result was "Release_SMS", the SGSN returns a Gb_RP_ERROR with an error cause as instructed by the gsmSCF to the MS, and the process returns to the Null state;
- if the result was "Redirect SMS", the SGSN modifies the data for the submitted short message as instructed by the gsmSCF, and the MSC handling continues;
- if the result was "Continue", the SGSN handling continues.

The SGSN checks whether Operator Determined Barring would prevent the submission of the short message.

- if Operator Determined Barring would prevent the submission of the short message, the SGSN returns a Gb_RP_ERROR with error cause "Operator determined barring" to the MS and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null state;
- if Operator Determined Barring would not prevent the submission of the short message, the SGSN handling continues.

The SGSN checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.

- if the two requests can be grouped in a single TC message, the SGSN requests a dialogue with the SMS-IWMSC, including the MAP_MO_FORWARD_SHORT_MESSAGE request;
  - if the dialogue opening is successful, the SGSN waits for the response from the SMS-IWMSC;
  - if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
  - if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN returns a Gb_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null state.
- if the two requests cannot be grouped in a single TC message, the SGSN requests a dialogue with the SMS-IWMSC, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;
  - if the dialogue opening is successful, the SGSN sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the SMS-IWMSC, and waits for the response from the SMS-IWMSC;
  - if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
  - if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN returns a Gb_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null state.
- if the SGSN receives a MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the SMS-IWMSC, it checks the content of the confirmation;
  - if the confirmation indicates that the submission of the short message was successful, the SGSN returns a Gb_RP_ACK to the MS and reports to the gsmSCF that the short message submission was successful, and the process returns to the Null state;

- if the confirmation indicates that the submission of the short message failed, the SGSN returns a Gb_RP_ERROR with the appropriate error cause to the MS and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null stateterminates;

- if the SGSN receives an LLC Release indication from the Gb interface, it aborts the dialogue with the SMS-IWMSC and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null state;

- if the dialogue with the SMS-IWMSC fails, the SGSN returns an A_RP_ERROR with cause "Network out of order" to the MS and reports to the gsmSCF that the short message submission has failed, and the process returns to the Null state.

When receiving the short message from the MS, the SGSN acts as follows:

- if there is incompatibility in the subscription check, the RP_ERROR cause requested facility not subscribed is provided to the mobile station;

- the SGSN opens a CAMEL dialogue as specified in 3GPP TS 23.078. If the CAMEL service bars the MO SM then the failure is reported to MS;

- if the short message transfer would contravene operator determined barring, , the failure is reported to the CAMEL service as specified in 3GPP TS 23.078 and the RP_ERROR cause operator determined barring is provided to the mobile station;

NOTE: The RP_ERROR causes are described in 3GPP TS 24.011 [37].

- if no error is detected, the short message transmission towards the IWMSC is initiated using the MAP_MO_FORWARD_SHORT_MESSAGE request.

If the service MAP_MO_FORWARD_SHORT_MESSAGE is started, the SGSN will check whether the grouping of MAP_OPEN request and MAP_MO_FORWARD_SHORT_MESSAGE request needs segmentation.

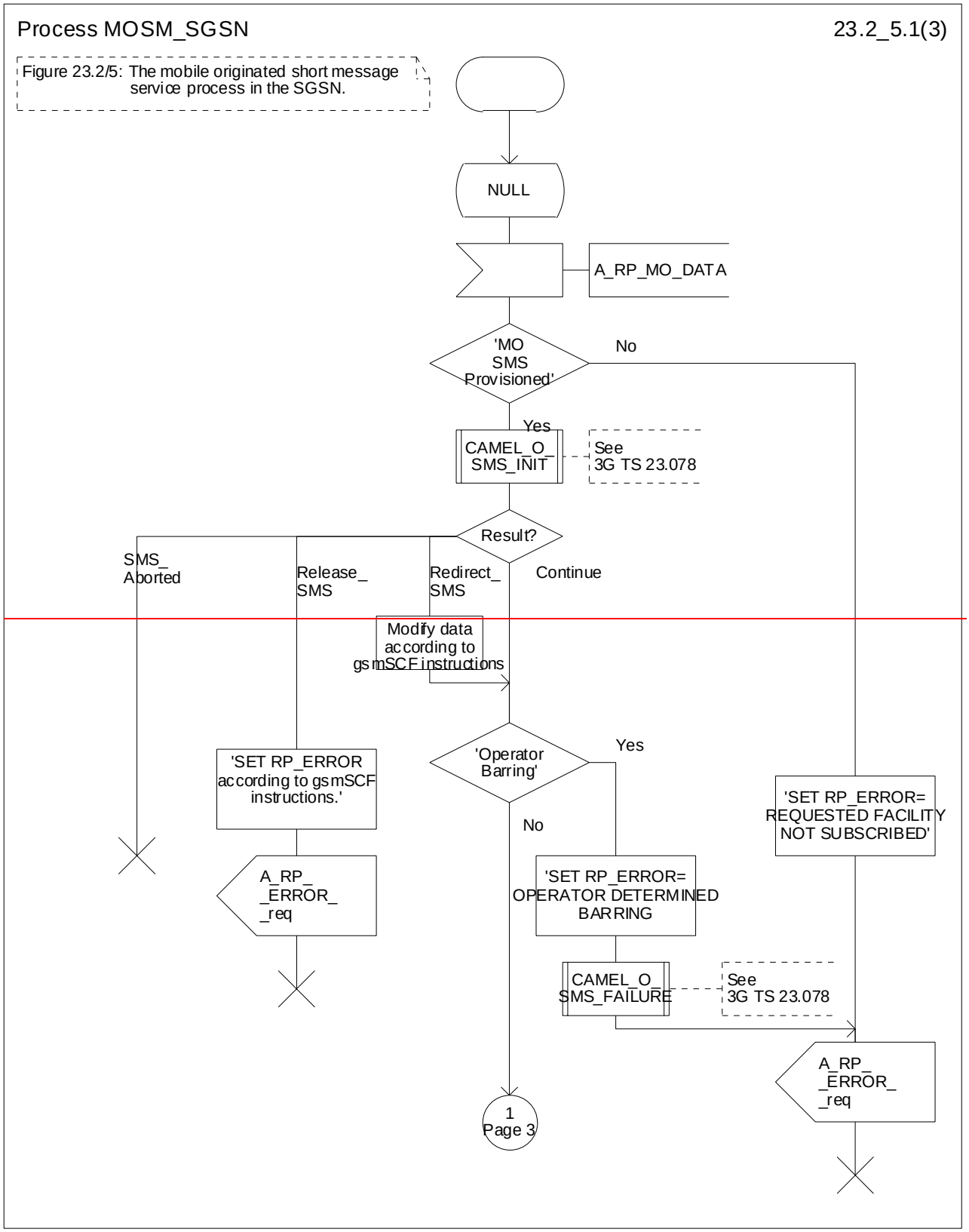
If this is the case then the MAP_OPEN request primitive shall be sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MO_FORWARD_SHORT_MESSAGE request is sent. As a response to the procedure, the servicing SGSN will receive the MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the IWMSC indicating that:

- the short message has been successfully delivered to the Service Centre. The successful submission of SM is reported to the CAMEL service as specified in 3GPP TS 23.078 and the acknowledgement is sent to the mobile station;

- one of several error cases has occurred. The mapping between MAP error causes and RP_ERROR causes is described in 3GPP TS 23.140. The failure in SM submission is reported to the CAMEL service as specified in 3GPP TS 23.078 and the appropriate indication is provided to the mobile station.

If the procedure failed, a provider error or an abort indication is received. The RP_ERROR cause network out of order is provided to the mobile station.

The mobile originated short message service processdure in the SGSN is shown in figure 23.2/5.


Process MOSM_SGSN
23.2_5.1(3)
Figure 23.2/5: The mobile originated short message service process in the SGSN.
NULL
A_RP_MO_DATA
'MO SMS Provisioned'
No
Yes
CAMEL_O_ SMS_INIT
See 3G TS 23.078
Result?
SMS_ Aborted
Release_ SMS
Redirect_ SMS
Continue
Modify data according to gsmSCF instructions
'Operator Barring'
Yes
No
'SET RP_ERROR according to gsmSCF instructions.'
'SET RP_ERROR= REQUESTED FACILITY NOT SUBSCRIBED'
A_RP_ _ERROR_ _req
'SET RP_ERROR= OPERATOR DETERMINED BARRING
CAMEL_O_ SMS_FAILURE
See 3G TS 23.078
A_RP_ _ERROR_ _req
1 Page 3

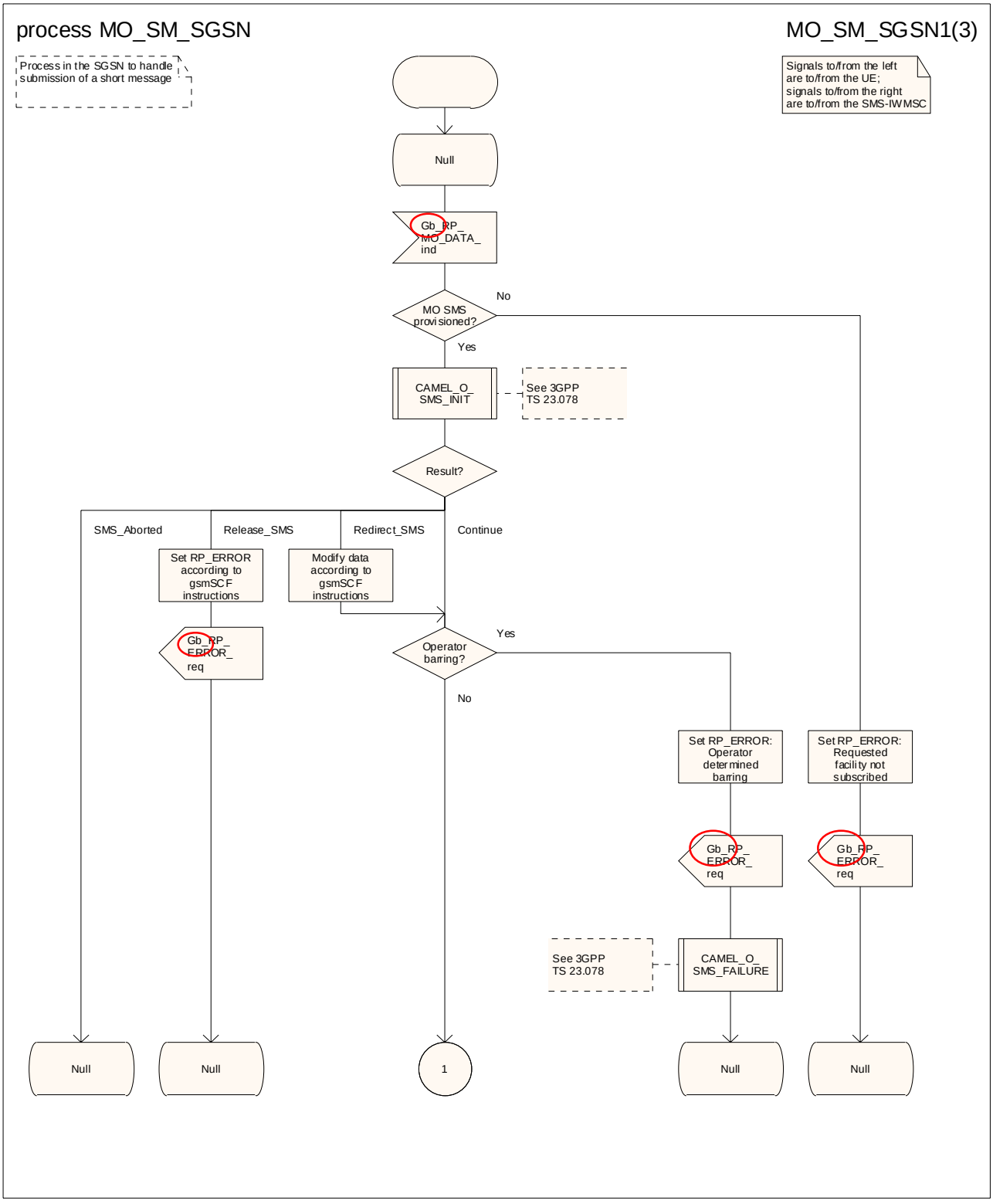
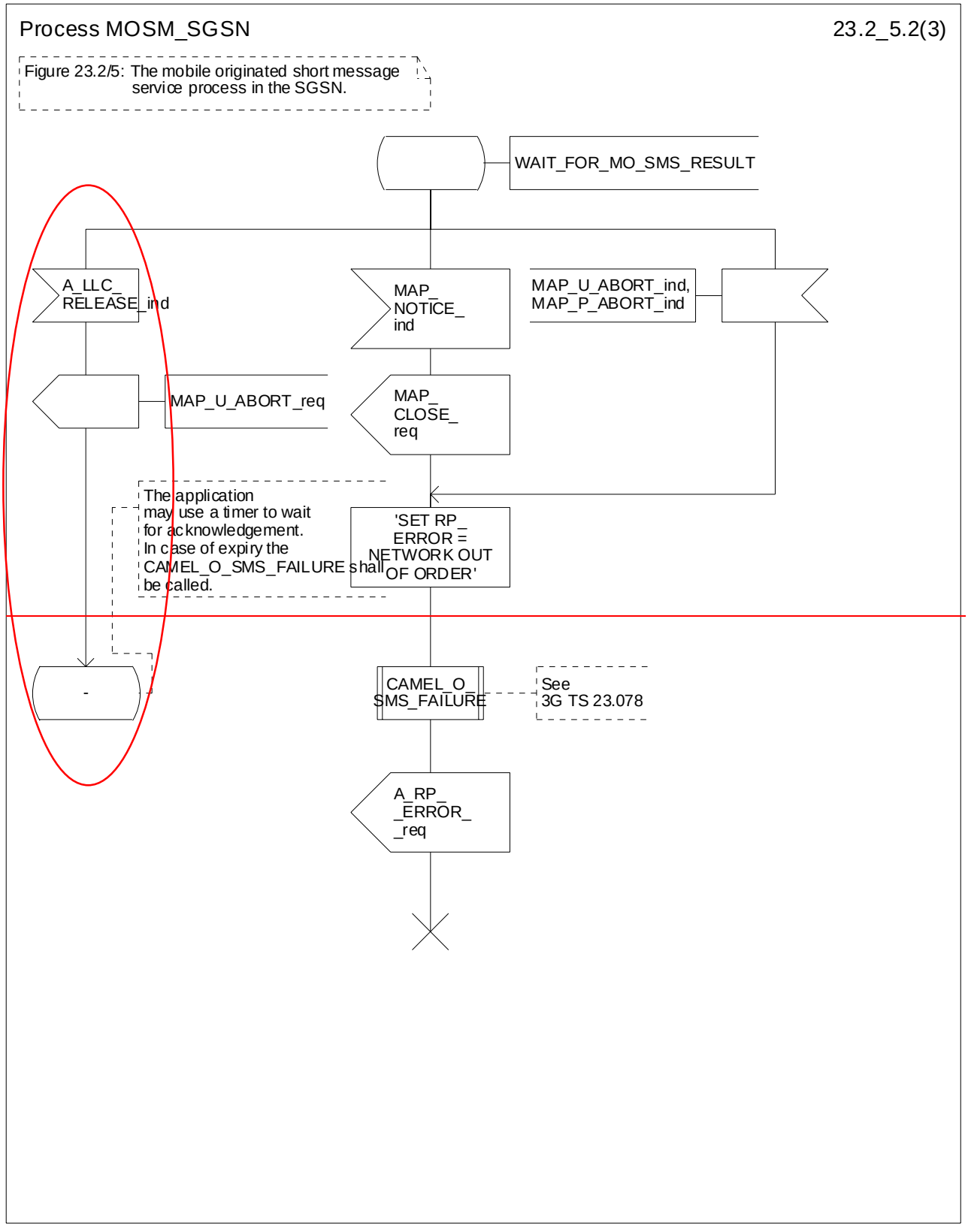


Figure 23.2/5 (sheet 1 of 3): Process MO_SM_SGSN


Process MOSM_SGSN
23.2_5.2(3)
Figure 23.2/5: The mobile originated short message service process in the SGSN.
WAIT_FOR_MO_SMS_RESULT
A_LLC_ RELEASE_ind
MAP_ NOTICE_ ind
MAP_U_ABORT_ind, MAP_P_ABORT_ind
MAP_U_ABORT_req
MAP_ CLOSE_ req
The application may use a timer to wait for acknowledgement. In case of expiry the CAMEL_O_SMS_FAILURE shall be called.
'SET RP_ ERROR = NETWORK OUT OF ORDER'
-
CAMEL_O_ SMS_FAILURE
See 3G TS 23.078
A_RP_ _ERROR_ _req

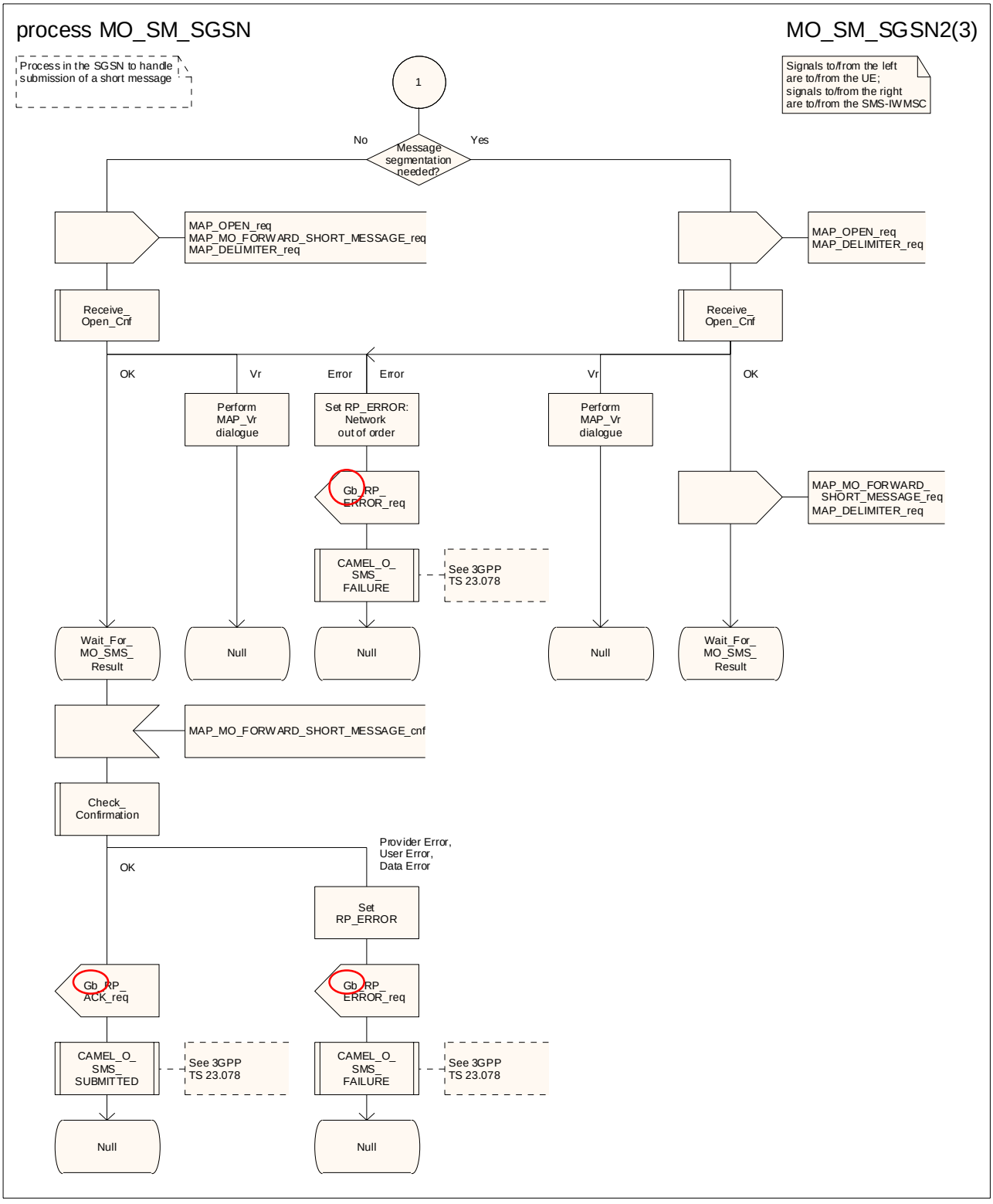
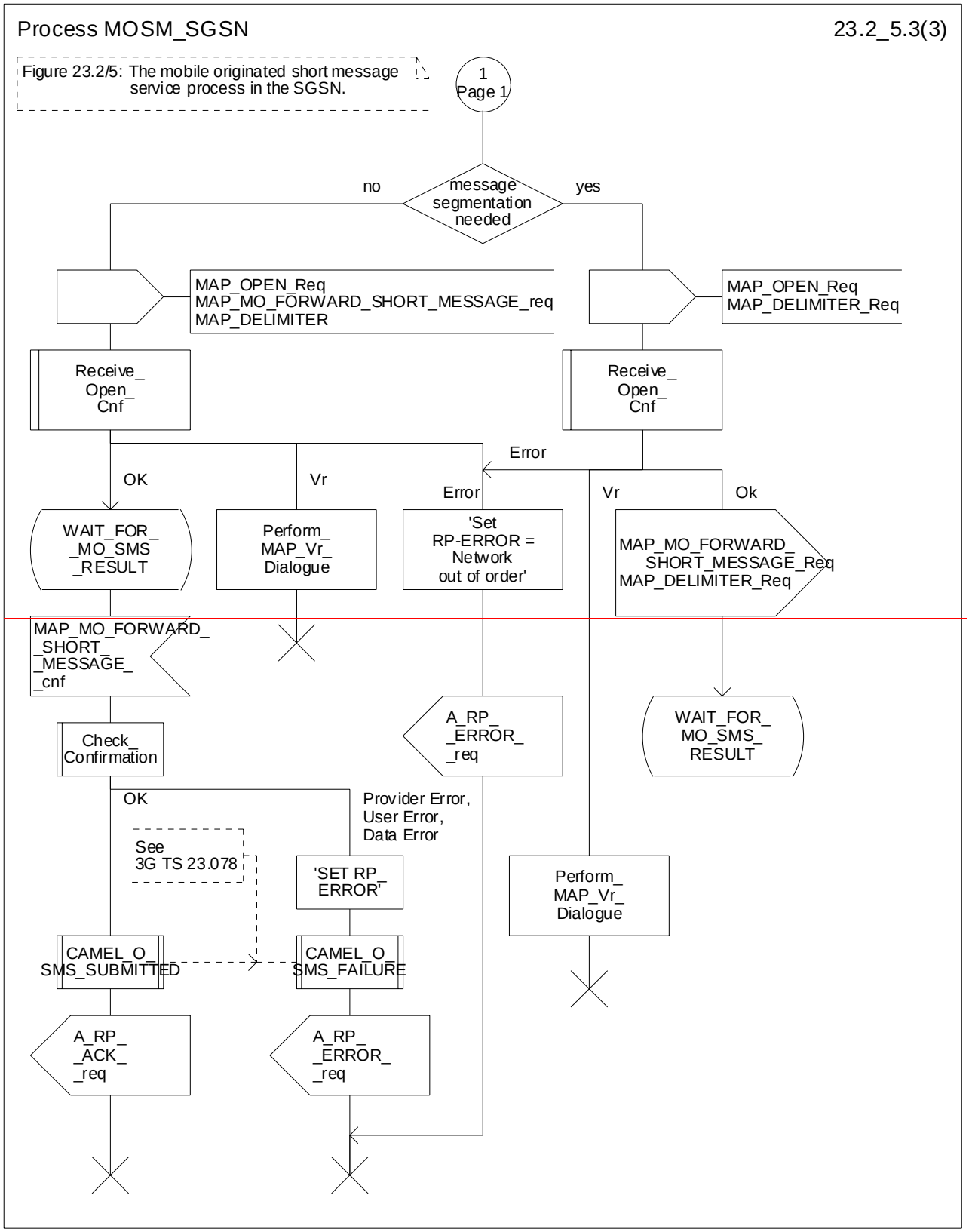


Figure 23.2/5 (sheet 2 of 3): Process MO_SM_SGSN


Process MOSM_SGSN
23.2_5.3(3)
Figure 23.2/5: The mobile originated short message service process in the SGSN.
1
Page 1
message segmentation needed
no
yes
MAP_OPEN_Req
MAP_MO_FORWARD_SHORT_MESSAGE_req
MAP_DELIMITER
MAP_OPEN_Req
MAP_DELIMITER_Req
Receive_ Open_ Cnf
Receive_ Open_ Cnf
Error
OK
Vr
Error
Vr
Ok
WAIT_FOR_ _MO_SMS _RESULT
Perform_ MAP_Vr_ Dialogue
'Set RP-ERROR = Network out of order'
MAP_MO_FORWARD_ SHORT_MESSAGE_Req
MAP_DELIMITER_Req
MAP_MO_FORWARD_ _SHORT_ _MESSAGE_ _cnf
A_RP_ _ERROR_ _req
WAIT_FOR_ MO_SMS_ RESULT
Check_ Confirmation
OK
Provider Error, User Error, Data Error
See 3G TS 23.078
'SET RP_ ERROR'
Perform_ MAP_Vr_ Dialogue
CAMEL_O_ SMS_SUBMITTED
CAMEL_O_ SMS_FAILURE
A_RP_ _ACK_ _req
A_RP_ _ERROR_ _req

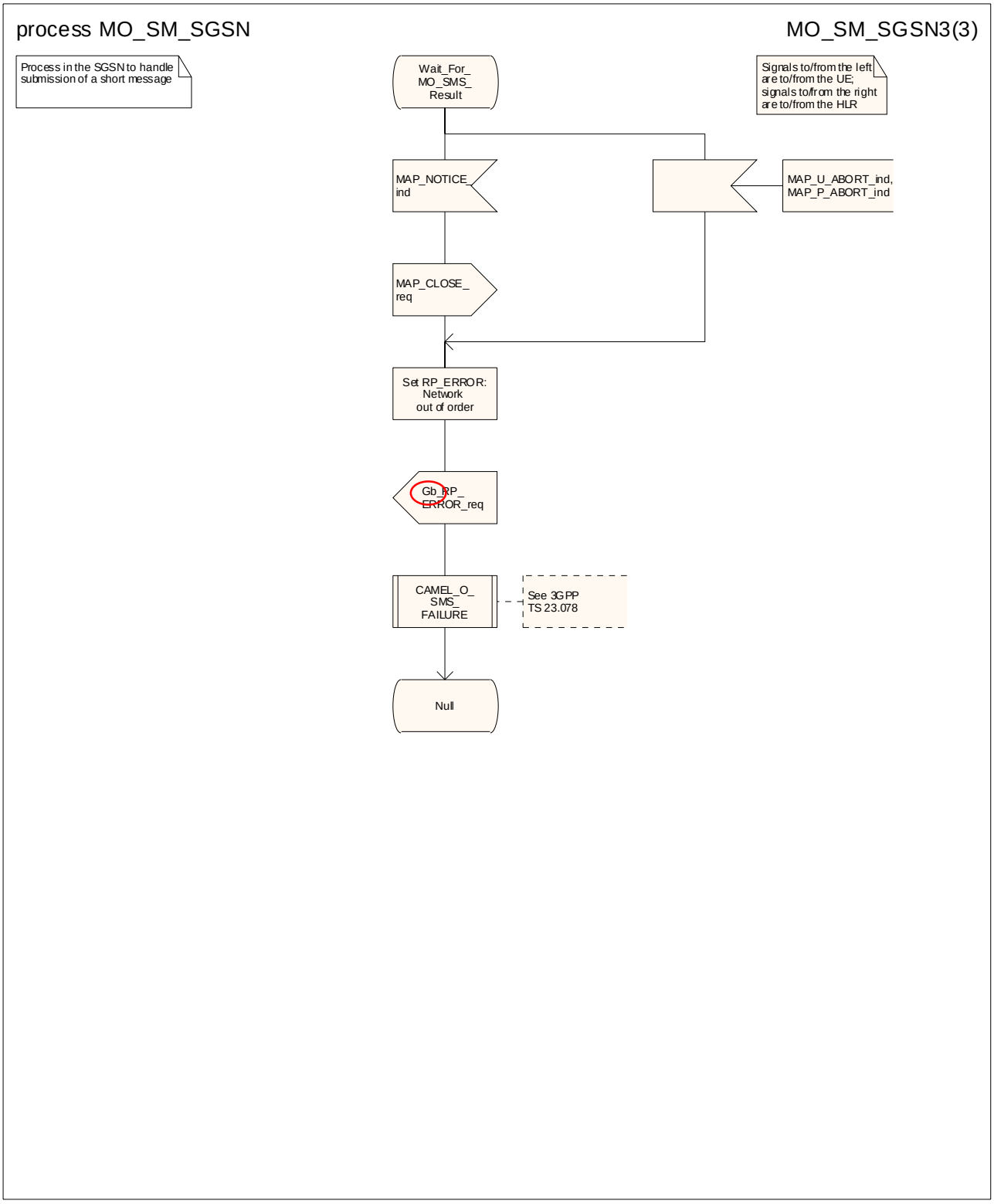


Figure 23.2/5 (sheet 3 of 3): Process MO_SM_SGSN

23.3 The mobile terminated short message transfer procedure

The mobile terminated short message transfer procedure is used for forwarding a short message or several short messages from a Service Centre to a mobile subscriber. The message flow for the mobile terminated short message procedure for a single short message transfer is shown in figure 23.3/1.

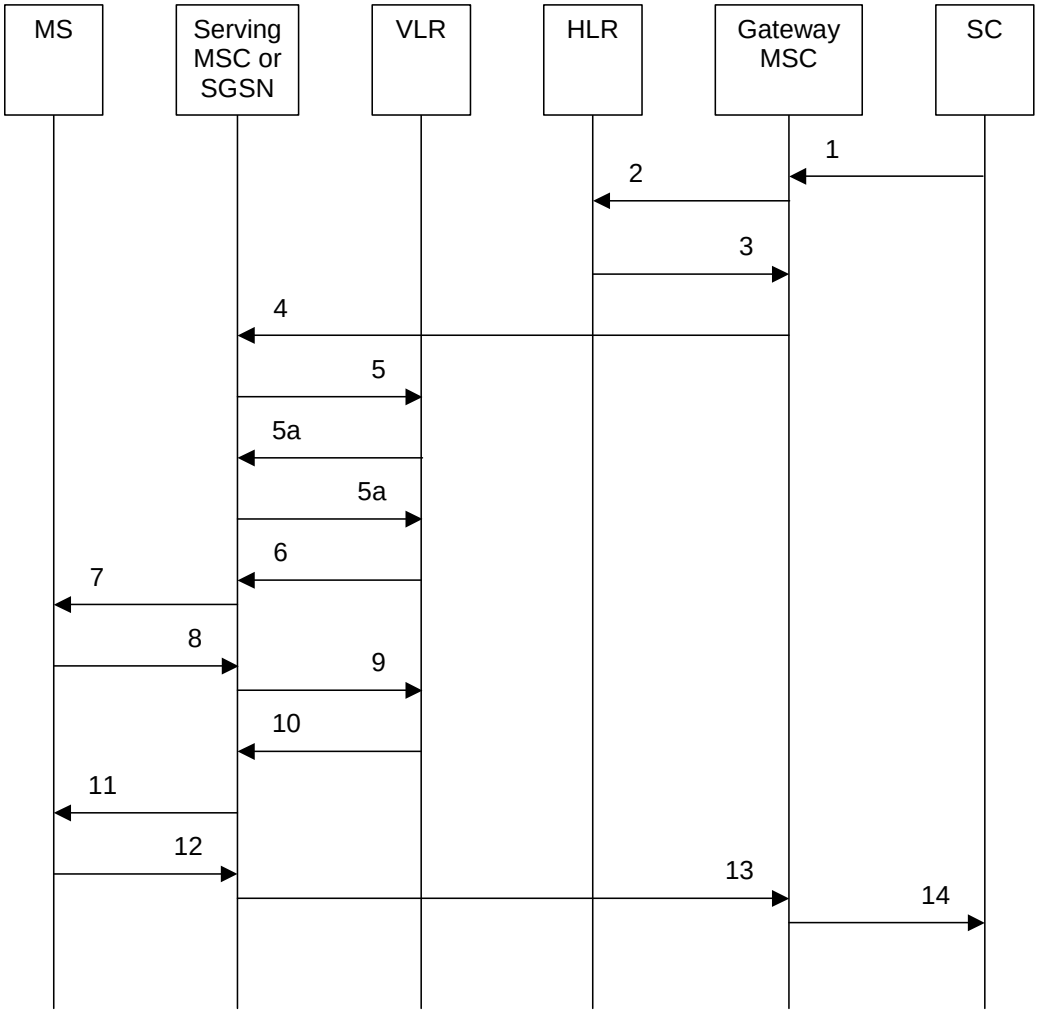


Figure 23.3/1: Mobile terminated short message service procedures

1) Short Message (3GPP TS 23.140).
2) MAP_SEND_ROUTING_INFO_FOR_SM.
3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK.
4) MAP_MT_FORWARD_SHORT_MESSAGE.
5) MAP_SEND_INFO_FOR_MT_SMS (*).
5a) MAP_CONTINUE_CAMEL_SMS_HANDLING (*)(**)
5b) MAP_SEND_INFO_FOR_MT_SMS (*)(**)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*).
7) Page (3GPP TS 24.008 [35]).
8) Page response (3GPP TS 24.008 [35]).
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*).
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*).
11) Short Message (3GPP TS 24.011 [37]).
12) Short Message Acknowledgement (3GPP TS 24.011 [37]).
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
14) Short Message Acknowledgement (3GPP TS 23.140).

(*) Messages 5), 5a), 5b), 6), 9), and 10) are not used by the SGSN.
(**) These messages are used only for a subscriber provisioned with MT-SMS-CSI in the VLR.

The message flow for the mobile terminated short message procedure for multiple short message transfer is shown in figure 23.3/2.

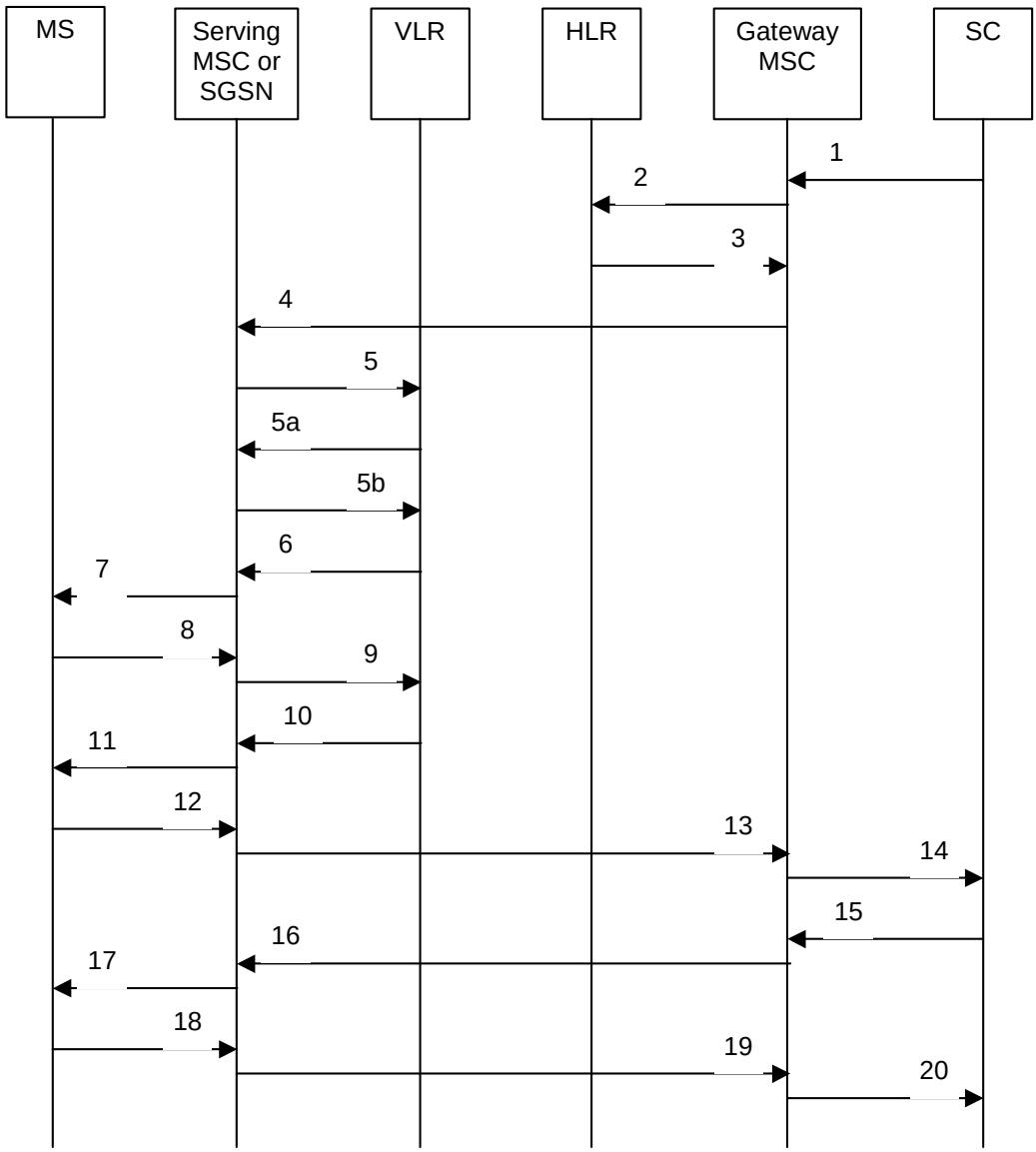


Figure 23.3/2: Mobile terminated short message procedure for multiple short message transfer

1) Short Message (3GPP TS 23.140).
2) MAP_SEND_ROUTING_INFO_FOR_SM.
3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK.
4) MAP_MT_FORWARD_SHORT_MESSAGE (note 1).
5) MAP_SEND_INFO_FOR_MT_SMS (*).
5a) MAP_CONTINUE_CAMEL_SMS_HANDLING (*)(**)
5b) MAP_SEND_INFO_FOR_MT_SMS (*)(**)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*).
7) Page (*3GPP TS 48.008 [49]*).
8) Page response (3GPP TS 24.008 [35]).
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*).
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*).
11) Short Message (3GPP TS 24.011 [37]).
12) Short Message Acknowledgement (3GPP TS 24.011 [37]).
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
14) Short Message Acknowledgement (3GPP TS 23.140).
15) Short Message (3GPP TS 23.140).
16) MAP_MT_FORWARD_SHORT_MESSAGE (note 2).
17) Short Message (3GPP TS 24.011 [37]).

18) Short Message Acknowledgement (3GPP TS 24.011 [37]).
19) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
20) Short Message Acknowledgement (3GPP TS 23.140).

(*) Messages 5), 5a), 5b) 6), 9), and 10) are not used by the SGSN.
(**) These messages are used only for a subscriber provisioned with MT-SMS-CSI in the VLR.

NOTE 1: The “More Messages To Send” flag is TRUE.
NOTE 2: The “More Messages To Send” flag is FALSE.

In the multiple short message transfer the service MAP_MT_FORWARD_SHORT_MESSAGE can be used several times. However, the short message transfer is always acknowledged to the Service Centre before the next short message is sent.

In addition the following MAP services are used:

MAP_PROCESS_ACCESS_REQUEST	(see clause 8.3); (*)
MAP_PAGE	(see clause 8.2); (*)
MAP_SEARCH_FOR_MS	(see clause 8.2); (*)
MAP_AUTHENTICATE	(see clause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see clause 8.6); (*)
MAP_CHECK_IMEI	(see clause 8.7);
MAP_FORWARD_NEW_TMSI	(see clause 8.9); (*)
MAP_REPORT_SM_DELIVERY_STATUS	(see clause 12.3);
MAP_INFORM_SERVICE_CENTRE	(see clause 12.6);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see clause 9.1); (*)
MAP_READY_FOR_SM	(see clause 12.4).

(*) Those messages are not used by SGSN.

23.3.14 Procedures in the SMS-GMSC

Any CAMEL-specific handling described in this subclause is omitted if the SMS-GMSC does not support CAMEL. CAMEL-specific handling is invoked only if the SMS-GMSC is integrated with the VMSC.

The short message handling function of the GMSCSMS-GMSC requests routing information when it receives an SC_RP_MT_DATA indication mobile terminated short message is received from a Service Centre.

The GMSCSMS-GMSC requests a MAP dialogue and sends the a MAP_SEND_ROUTING_INFO_FOR_SM request, with an indication of whether the SMS-GMSC supports the delivery of short messages via an SGSN, to the HLR containing the subscriber data of the mobile subscriber.

- if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure" and the process returns to the Null state;

- if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol, and the handling continues as follows:

  - if the HLR did not supply routeing information, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error, and the process returns to the Null state;

NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].

  - if the HLR supplied routeing information, the handling continues as described below under the heading "Short message delivery attempts".

- if the macro Receive_Open_Cnf takes the "OK" exit, the SMS-GMSC waits for routeing information from the HLR.

While the SMS-GMSC is waiting for routeing information from the HLR:

- if the service centre aborts the dialogue with the SMS-GMSC, the SMS-GMSC aborts the dialogue with the HLR and the process returns to the Null state;

- If the dialogue with the HLR fails, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure" and the process returns to the Null state;

- if the SMS-GMSC receives a MAP_SEND_ROUTING_INFO_FOR_SM confirmation, it checks the confirmation.

  - if the confirmation contained a provider error or a data error, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure", and the process returns to the Null state;

  - if the confirmation contained a user error, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error and waits for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR;

NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].

  - if the confirmation contained routeing information, the SMS-GMSC checks whether the routeing information included an LMSI;

    - if the routeing information included an LMSI, the SMS-GMSC sets the destination reference to the IMSI of the destination subscriber, and the destination address in the short message relay protocol to the LMSI;

    - if the routeing information did not include an LMSI, the SMS-GMSC marks the destination reference as not included, and sets the destination address in the short message relay protocol to the IMSI of the destination subscriber.

  - in both cases, the SMS-GMSC then waits for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR;

While the SMS-GMSC is waiting for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR:

- if the service centre aborts the dialogue with the SMS-GMSC, the SMS-GMSC aborts the dialogue with the HLR and the process returns to the Null state;

- if the dialogue with the HLR fails, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

- if the HLR closes the dialogue without sending a MAP_INFORM_SERVICE_CENTRE, the SMS-GMSC checks whether routeing information was received from the HLR.

  - if the HLR did not supply routeing information, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error, and the process returns to the Null state;

NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].

  - if the HLR supplied routeing information, the handling continues as described below under the heading "Short message delivery attempts".

- if the SMS-GMSC receives a MAP_INFORM_SERVICE_CENTRE indication, it checks the indication.

  - if the indication is badly formed, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

  - if the indication is OK, the SMS-GMSC checks whether the MAP_SEND_ROUTING_INFO_FOR_SM confirmation contained an error.

- if the MAP_SEND_ROUTING_INFO_FOR_SM confirmation contained an error, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

- if the MAP_SEND_ROUTING_INFO_FOR_SM confirmation did not contain an error, which implies that it contained routeing information, the handling continues as described below under the heading "Short message delivery attempts".

~~As an outcome of the procedure the SMS-GMSC receives a MAP_SEND_ROUTING_INFO_FOR_SM indicating:~~

~~- an unsuccessful event indication containing an error;~~

~~The mapping between the MAP error causes and the RP_ERROR causes is explained in 3GPP TS 23.140.~~

~~- a successful event indication containing the following parameters:~~

~~- an IMSI optionally accompanied by an LMSI; and~~

~~- one or two routing addresses (servicing MSC, SGSN or both numbers).~~

~~The LMSI shall not be used if the short message is routed towards the SGSN.~~

~~The GMSC may also receive a MAP_INFORM_SERVICE_CENTRE indication after the MAP_SEND_ROUTING_INFO_FOR_SM confirmation. The parameter MW Status in the message indicates whether or not the Service Centre address is stored in the Message Waiting Data. It also indicates the status of the MCEF, MNRF and MNRG flags in the HLR. The message also indicates the value of the MNRR if this is stored in the HLR and one or both of the MNRF and MNRG flags is set in the HLR.~~

~~If the MSISDN-Alert stored in the MWD data is not the same as the MSISDN sent to the HLR, the MSISDN-Alert is included in the MAP_INFORM_SERVICE_CENTRE indication. This MSISDN-Alert shall be transferred in a delivery failure report to the SC.~~

~~In the abnormal end or in the provider error case the SMS-GMSC reports a system failure error to the SC.~~

Short message delivery attempts

When the ~~GMSC~~SMS-GMSC has obtained the routing information needed to forward a mobile terminated short message to the serving node (MSC or SGSN) it calls the procedure MT_SM_Delivery_Attempt_GMSC.

If the SMS-GMSC receives both MSC and SGSN numbers ~~are received~~ from the HLR as routeing information, ~~the~~ it ~~SMS-GMSC~~ may choose which serving node ~~(SGSN or MSC)~~to use for the first delivery attempt.

If the first delivery attempt succeeds, or the delivery is aborted, the process returns to the Null state. If the first delivery attempt fails and the HLR provided a second routeing address, the SMS-GMSC attempts to deliver the short message through the second choice serving node. The process then returns to the Null state.

For each delivery attempt, the SMS-GMSC checks whether the serving node for the delivery attempt is the SMS-GMSC. If the serving node for the delivery attempt is the SMS-GMSC, ~~then~~ the handling continues as described under the heading "Serving node is SMS-GMSC"; if the serving node for the delivery attempt is not the SMS-GMSC, the handling continues as described under the heading "Serving node is separate from SMS-GMSC".

Serving node is SMS-GMSC

The SMS-GMSC invokes the macro MT_SM_Transfer_MSC. This macro is described in subclause 23.3.3~~1~~ and in figure ~~23.3/4~~23.3/8.

If the macro takes the Abort exit, the ~~GMSC~~SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98] and the procedure returns a Fail result.

If the macro takes the Error ~~or Release SMS~~ exit, the ~~GMSC~~SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98]. If required, the ~~GMSC~~SMS-GMSC reports the outcome of the delivery attempt to the HLR. The ~~GMSC~~SMS-GMSC sends an error report to the service centre and the procedure returns a Fail result.

NOTE: if the macro takes the Error exit, the SMS-GMSC maps the MAP User Error to the corresponding SC_RP error, as defined in 3GPP TS 23.040 [26].

If the macro takes the Release SMS exit, the SMS-GMSC sends an error report to the service centre and the procedure returns a Fail result.

If the macro takes the OK exit, the ~~GMSC~~SMS-GMSC reports the successful delivery to the gsmSCF as described in 3GPP TS 23.078 [98] and checks whether the "More messages to send" indication was set in the request from the service centre.

- If the "~~-~~More messages to send" indication was not set, the ~~GMSC~~SMS-GMSC reports the successful delivery to the HLR, if necessary, and reports the successful delivery to the service centre. The procedure returns a Pass result.

- If the " More messages to send" indication was set, the ~~GMSC~~SMS-GMSC reports the successful delivery to the service centre and waits for another message delivery request from the service centre. When the request is received, the ~~GMSC~~SMS-GMSC opens a dialogue with the gsmSCF as described in 3GPP TS 23.078 [98].

  - If the gsmSCF bars the delivery of the short message (Release_SMS result) the ~~GMSC~~SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.

  - If the gsmSCF instructs the ~~GMSC~~SMS-GMSC to continue with the delivery, the ~~GMSC~~SMS-GMSC sends the message over the access interface to the destination MS and waits for a response.

    - If the delivery was successful, the ~~GMSC~~SMS-GMSC reports the successful delivery to the gsmSCF as described in 3GPP TS 23.078 [98] and checks whether the "More messages to send" indication was set in the request from the service centre, as above.

    - If the delivery was unsuccessful, the ~~GMSC~~SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98]. If required, the ~~GMSC~~SMS-GMSC reports the outcome of the delivery attempt to the HLR. The ~~GMSC~~SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.

Serving node is separate from SMS-GMSC

~~If the serving node for the delivery attempt is not the GMSC, t~~The ~~GMSC~~SMS-GMSC checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.

- if the two requests can be grouped in a single TC message, the SMS-GMSC requests a dialogue with the serving node, including the MAP_MT_FORWARD_SHORT_MESSAGE request;

  - if the dialogue opening is successful, the SMS-GMSC waits for the response from the serving node;

  - if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol.

    - if delivery was successful, the procedure returns a "Pass" result;

    - if delivery failed, the procedure returns a "Fail" result.

  - if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with cause "System Failure" to the SC and the procedure returns a "Fail" result.

- if the two requests can be grouped in a single TC message, the SMS-GMSC requests a dialogue with the serving node, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;

  - if the dialogue opening is successful, the SMS-GMSC sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the serving node, and waits for the response from the serving node;

  - if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol.

    - if delivery was successful, the procedure returns a "Pass" result;

    - if delivery failed, the procedure returns a "Fail" result.

  - if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with cause "System Failure" to the SC and the procedure returns a "Fail" result.

~~If the grouping of MAP_OPEN request and MAP_MT_FORWARD_SHORT_MESSAGE request together would need segmenting, these primitives must not be grouped together. The MAP_OPEN request primitive is sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MT_FORWARD_SHORT_MESSAGE request is sent.~~

If ~~an LMSI has been provided in~~ the MAP_SEND_ROUTING_INFO_FOR_SM confirmation included an LMSI, it can be included in the sm-RP-DA information field of the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC. In this case, the IMSI ~~must~~ shall be included in the Destination Reference of the MAP_OPEN request. The SMS-GMSC shall not send an LMSI to an SGSN. If ~~the LMSI is not sent by~~ the SMS-GMSC does not send an LMSI to the serving node, the sm-RP-DA information field in the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC or SGSN shall contain the IMSI, and the Destination Reference in the MAP_OPEN request shall not be present. The ~~Service Centre address is sent in the~~ parameter SM_RP_OA shall contain the Service Centre address. The More Messages To Send flag is set to TRUE or FALSE ~~depending on~~according to the information received from the Service Centre.

When the ~~GMSC~~SMS-GMSC receives the response from the serving node, it checks the content of the response.

If the response indicates successful delivery, the ~~GMSC~~SMS-GMSC checks whether the "More messages to send" indication was set in the request from the service centre.

- If the " More messages to send" indication was not set, the ~~GMSC~~SMS-GMSC reports the successful delivery to the HLR, if necessary, and reports the successful delivery to the service centre. The procedure returns a Pass result.

- If the " More messages to send" indication was set, the ~~GMSC~~SMS-GMSC reports the successful delivery to the service centre and waits for another message delivery request from the service centre. When the request is received, the ~~GMSC~~SMS-GMSC sends a MAP_MT_FORWARD_SHORT_MESSAGE request to the serving node and waits for a response.

  - If the delivery was successful, the ~~GMSC~~SMS-GMSC checks whether the "More messages to send" indication was set in the request from the service centre, as above.

  - If the delivery was unsuccessful, the ~~GMSC~~SMS-GMSC reports the outcome of the delivery attempt to the HLR, if required. The ~~GMSC~~SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.

The ~~GMSC~~SMS-GMSC invokes the procedure MAP_REPORT_SM_DELIVERY_STATUS, if:

- the reason received from the serving node for failure to deliver the message is ~~an~~ absent subscriber_SM, ~~an~~ unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded ~~indication is received from the serving MSC, SGSN or both~~, and

- the SC address is not yet included in the MWD set, or

- the reason received from the serving node ~~(MSC or SGSN)~~ for failure to deliver the message is absent subscriber_SM, unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded, and the corresponding flag in the HLR (as indicated the information received in the MAP_INFORM_ SERVICE_CENTRE) is not set, or

- the reason received from the serving node (MSC or SGSN) for failure to deliver the message is absent subscriber_SM and the absent subscriber diagnostic is different from the absent subscriber diagnostic received in the MAP_INFORM_ SERVICE_CENTRE.

If absent subscriber diagnostic information (see 3GPP ~~TS~~ TS 23.~~140~~040 [26]) is included with the absent subscriber_SM error indication then the SMS-GMSC relays this information ~~is relayed~~ to the HLR using the ~~procedure~~ MAP_REPORT_SM_DELIVERY_STATUS service.

If there was an attempt to deliver the short message through both the MSC and the SGSN, and both delivery attempts failed with causes as described above, the SMS-GMSC reports to the HLR the two unsuccessful SMS delivery outcomes for GPRS and non GPRS ~~are sent to the HLR~~.

If there was an attempt to deliver the short message through both the MSC and the SGSN, and the first delivery failed with causes described above ~~and~~ but the second delivery succeeded, the SMS-GMSC reports to the HLR the unsuccessful and successful SMS delivery outcomes for GPRS and non GPRS ~~are sent to HLR~~.

The SMS-GMSC may also report successful delivery to the HLRwhen the first SMS delivery through the MSC was successful, if the MNRF or MCEF ~~flag~~ or both were set in the HLR.

The SMS-GMSC may also report successful delivery to the HLR when the first SMS delivery through the SGSN was successful, if the MNRG or MCEF ~~flag~~ or both were set in the HLR.

This procedure is described in detail in clause 23.5.

The SMS-GMSC maps "Unexpected data value" and ~~s~~"System failure" MAP errors from the serving node ~~are indicated as~~ to a ~~s~~"System failure" error to the SC. Other MAP errors are ~~indicated using~~mapped to appropriate cause values and diagnostic information ~~between~~ from the ~~GMSC~~SMS-GMSC ~~and~~ to the SC as described in 3GPP TS 23.040 [26] and 3GPP TS 24.011 [37].

The SMS-GMSC maps the ~~u~~"Unidentified subscriber" MAP error ~~is indicated~~ to ~~the SC as~~ an "Absent subscriber" error with diagnostic information set to ~~'~~"Unidentified subscriber"~~'~~ to the SC as described in 3GPP TS 23.040 [26].

Note that the indication~~,~~ of~~n~~ which number belongs to the SGSN and which to the MSC, received from the HLR ~~at routing information result~~in the MAP_SEND_ROUTING_INFO_FOR_SM confirm (see clause 23.3.2~~3~~) will enable the ~~GMSC~~SMS-GMSC to map the causes received from ~~the SGSN, MSC~~one or both serving nodes into the appropriate causes for non GPRS, GPRS or both, and send them to the SC and the HLR.

~~If there are more short messages to send in the Service Centre and the previous short message transfer succeeded, then the SMS-GMSC awaits the next short message.~~

The mobile terminated short message transfer procedure in the SMS-GMSC is shown in figure ~~23.3/7~~23.3/3.

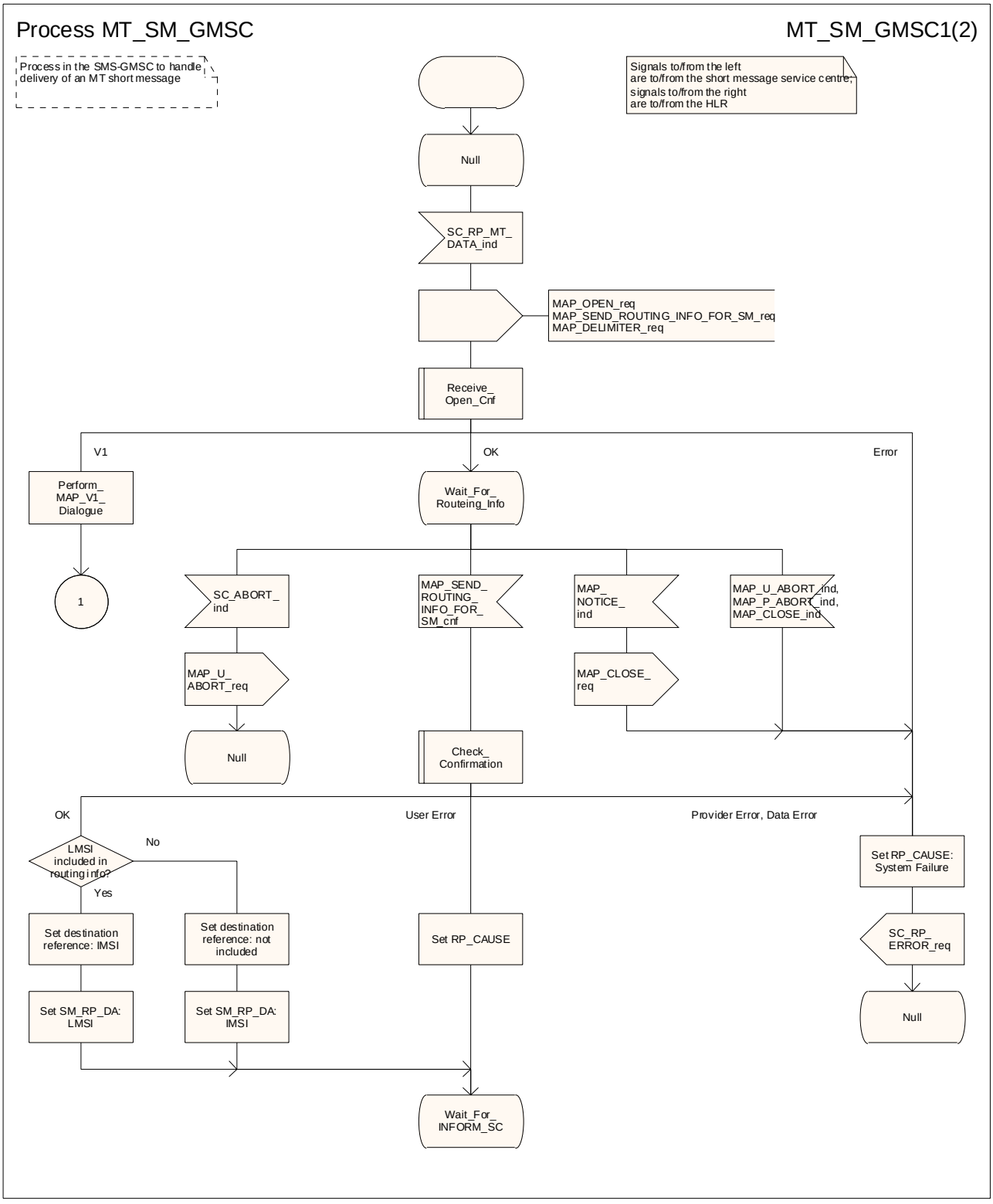


Figure ~~23.3/7~~23.3/3 (sheet 1 of 2): Process MT_SM_GMSC

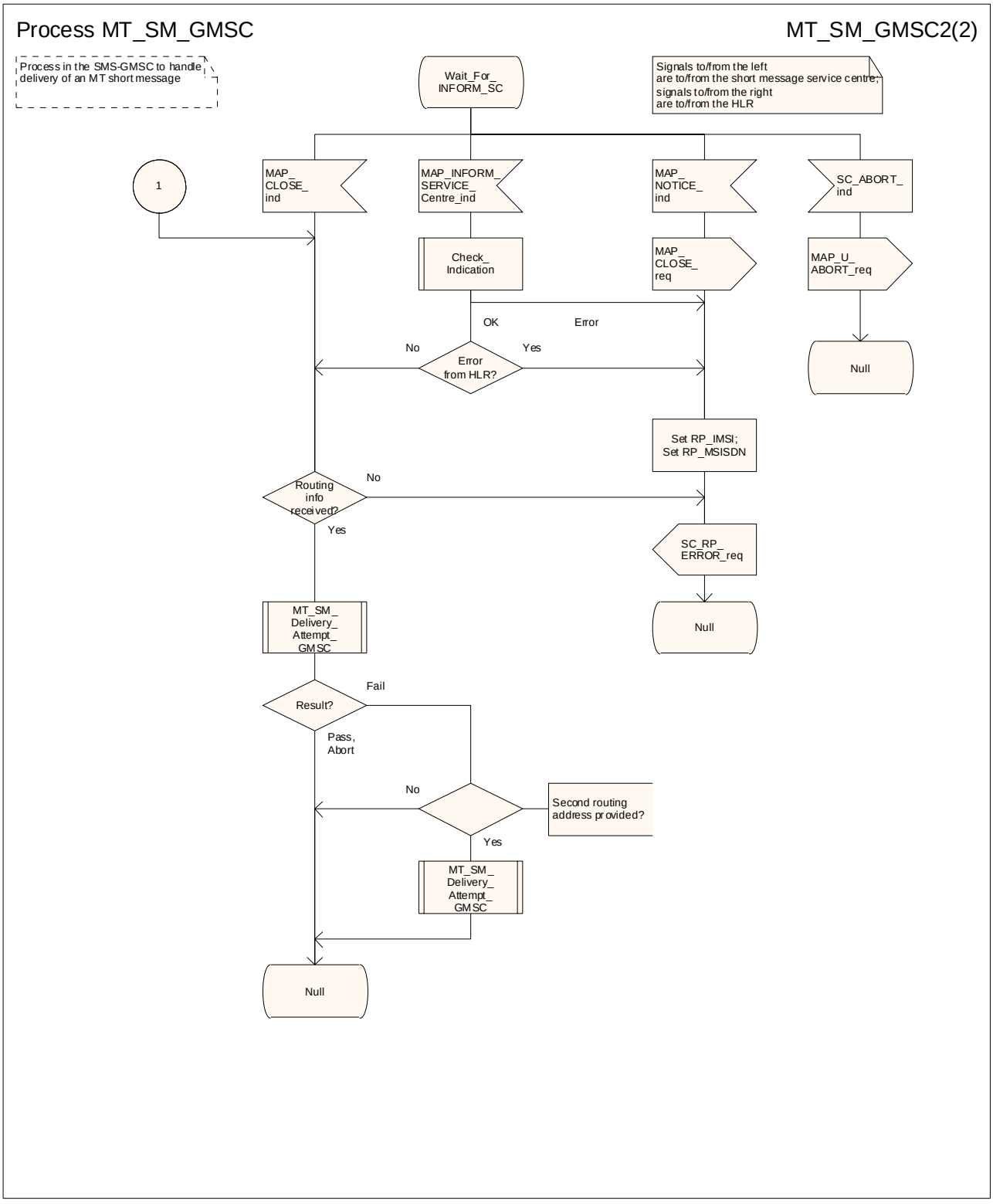


Figure ~~23.3/7~~23.3/3 (sheet 2 of 2): Process MT_SM_GMSC

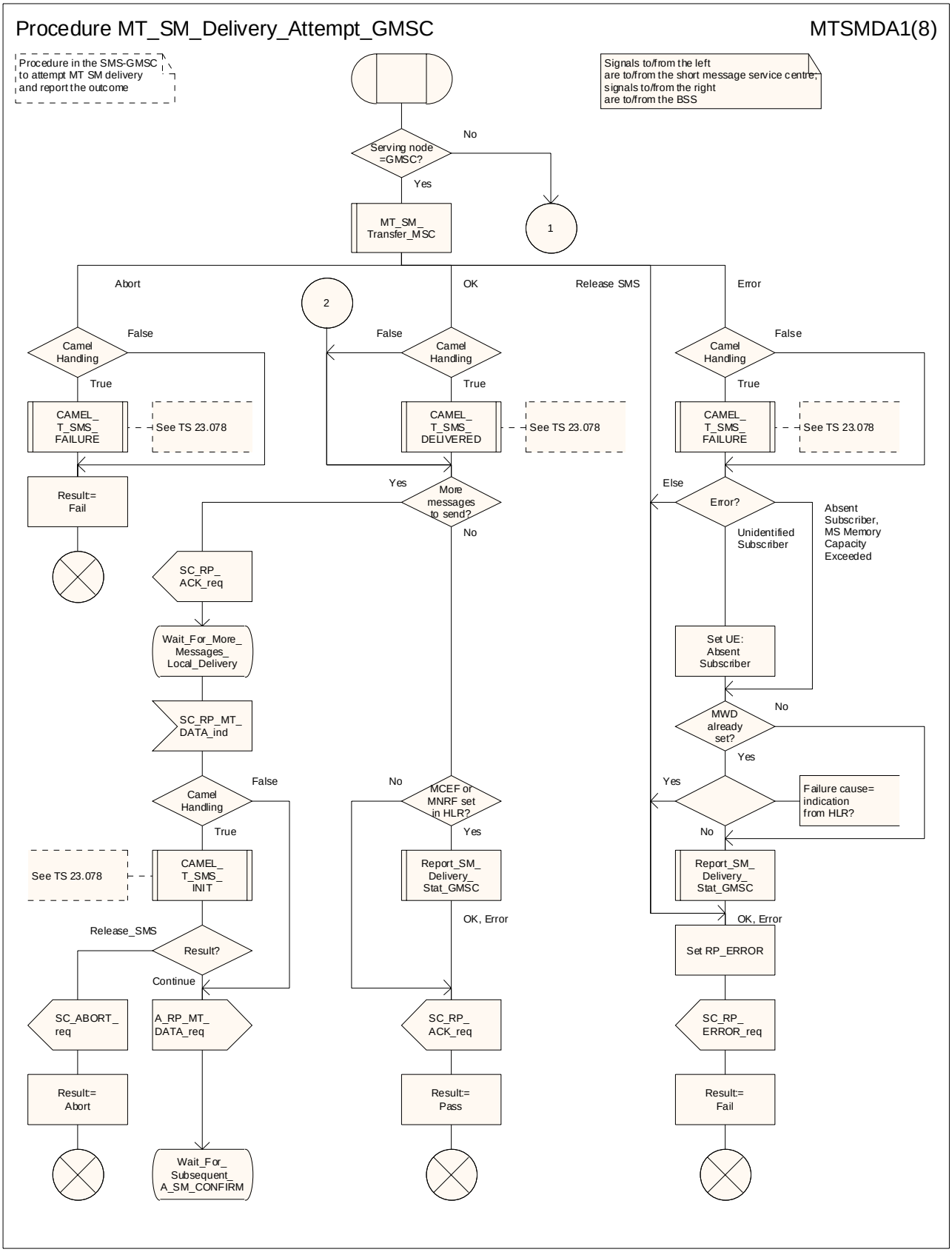


Figure ~~23.3/7a~~23.3/4 (sheet 1 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

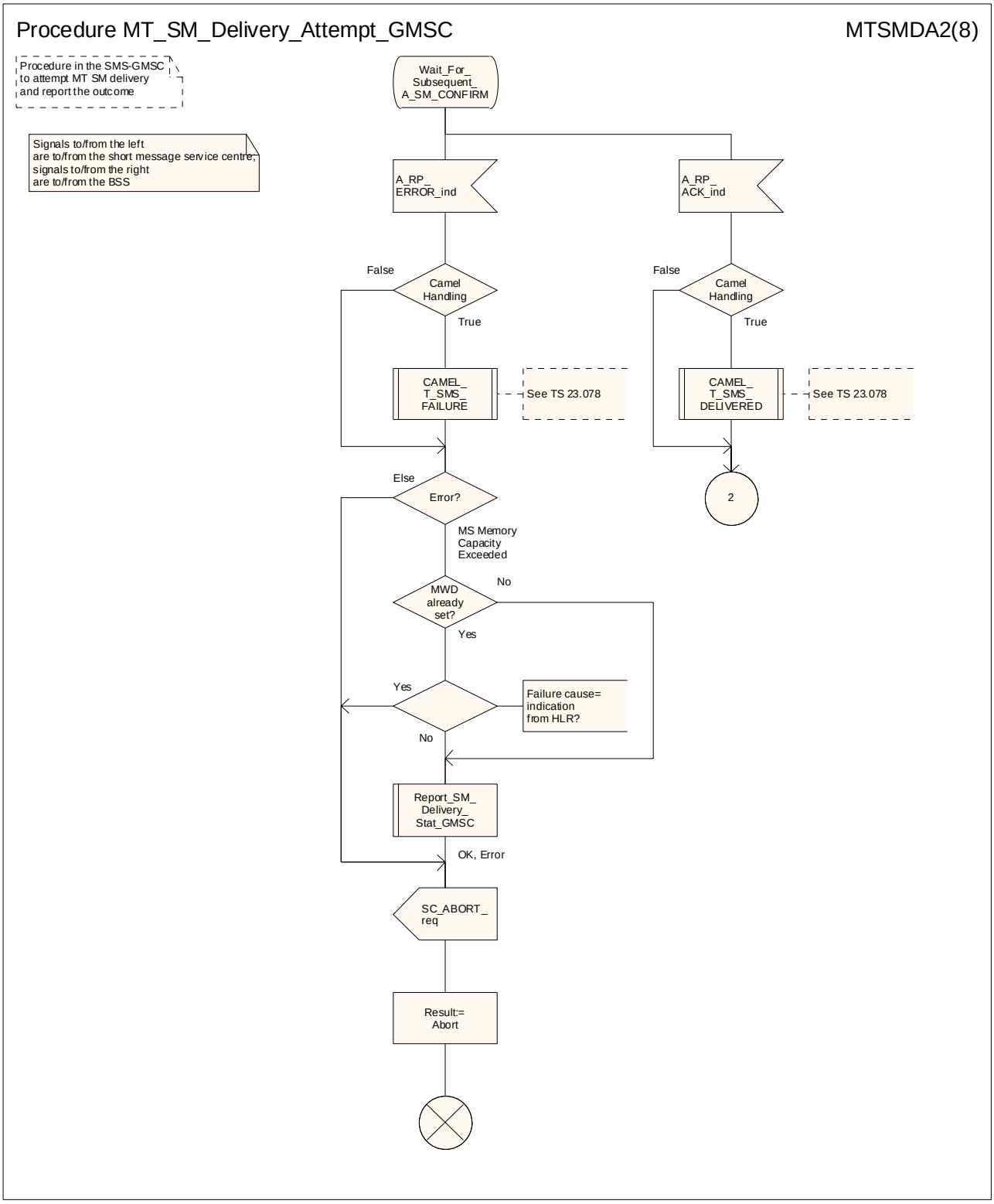
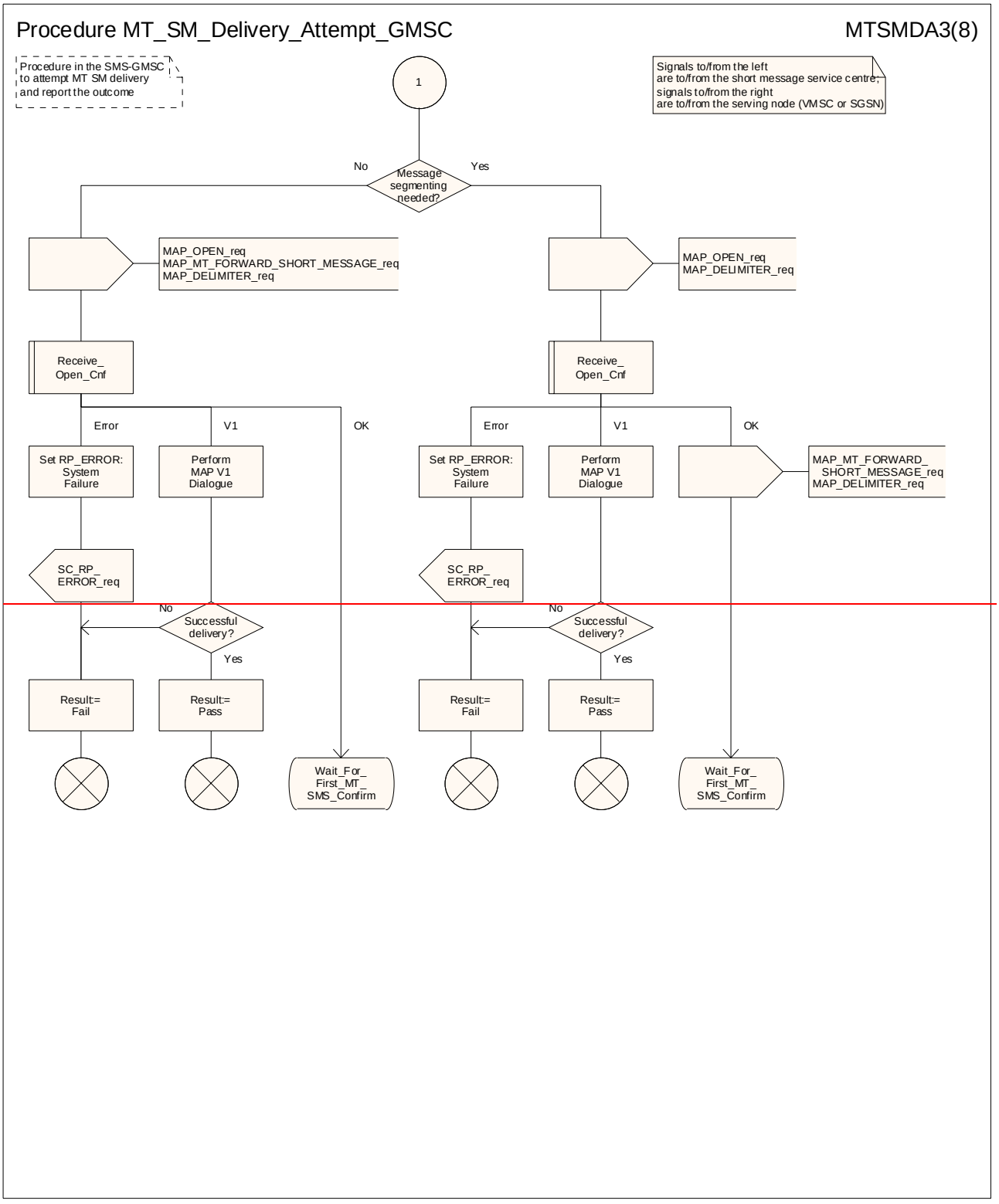


Figure ~~23.3/7a~~23.3/4 (sheet 2 of 8): Procedure MT_SM_Delivery_Attempt_GMSC


Procedure MT_SM_Delivery_Attempt_GMSC
MTSMDA3(8)
Procedure in the SMS-GMSC to attempt MT SM delivery and report the outcome
1
Signals to/from the left are to/from the short message service centre; signals to/from the right are to/from the serving node (VMSC or SGSN)
No
Message segmenting needed?
Yes
MAP_OPEN_req
MAP_MT_FORWARD_SHORT_MESSAGE_req
MAP_DELIMITER_req
MAP_OPEN_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Receive_ Open_Cnf
Error
V1
OK
Error
V1
OK
Set RP_ERROR: System Failure
Perform MAP V1 Dialogue
Set RP_ERROR: System Failure
Perform MAP V1 Dialogue
MAP_MT_FORWARD_ SHORT_MESSAGE_req
MAP_DELIMITER_req
SC_RP_ ERROR_req
SC_RP_ ERROR_req
No
Successful delivery?
No
Successful delivery?
Yes
Yes
Result:= Fail
Result:= Pass
Result:= Fail
Result:= Pass
Wait_For_ First_MT_ SMS_Confirm
Wait_For_ First_MT_ SMS_Confirm

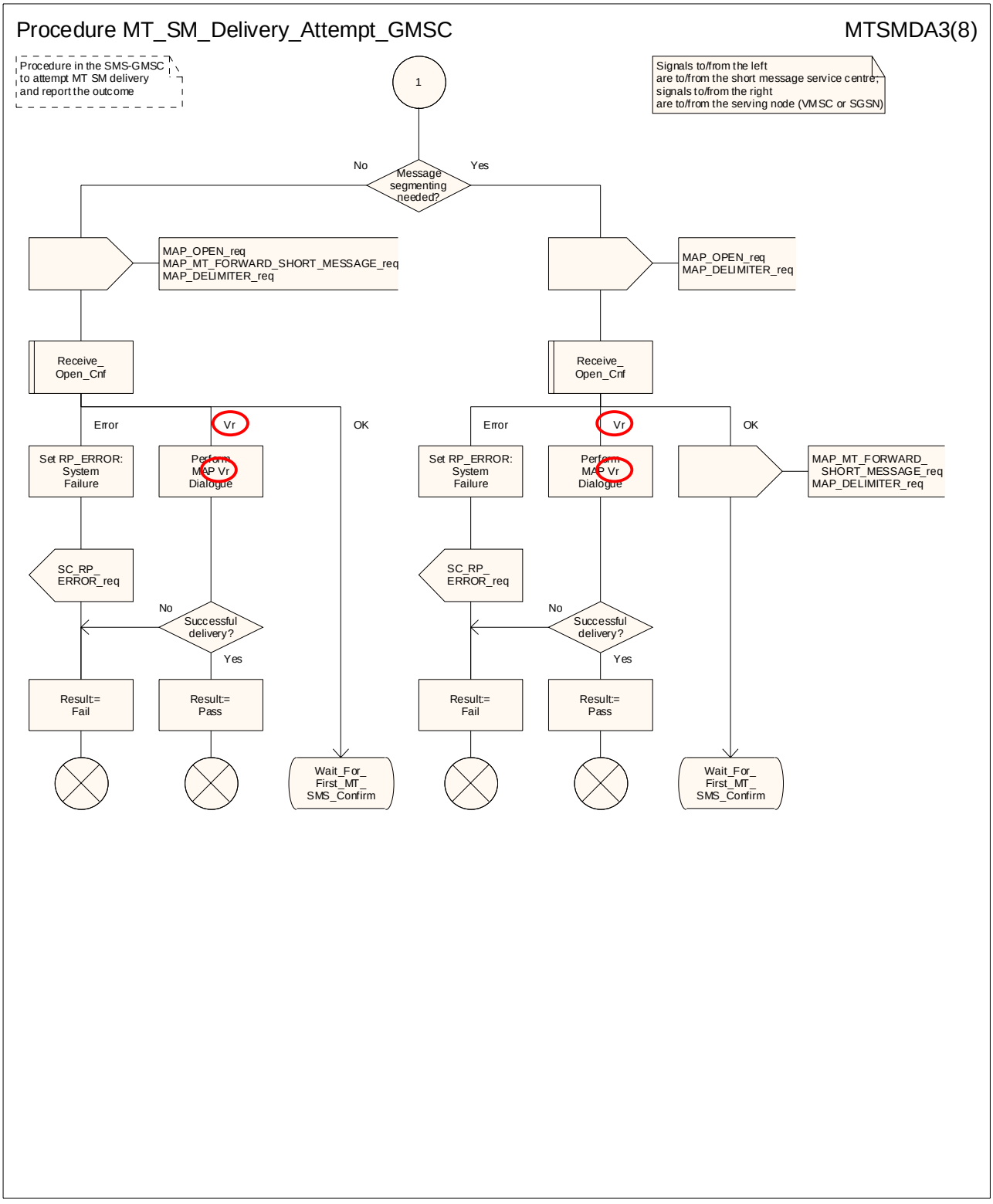


Figure ~~23.3/7a~~23.3/4 (sheet 3 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

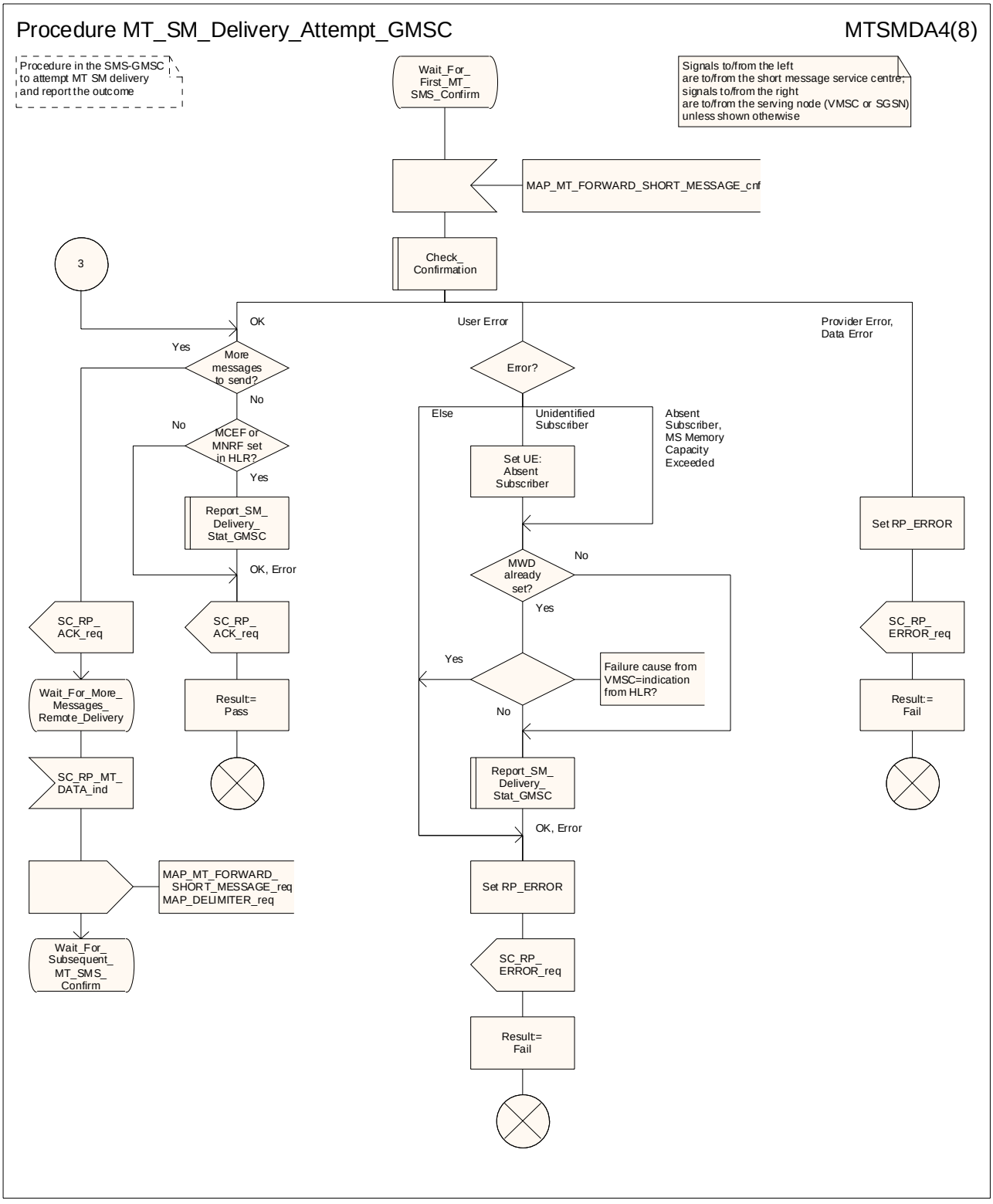
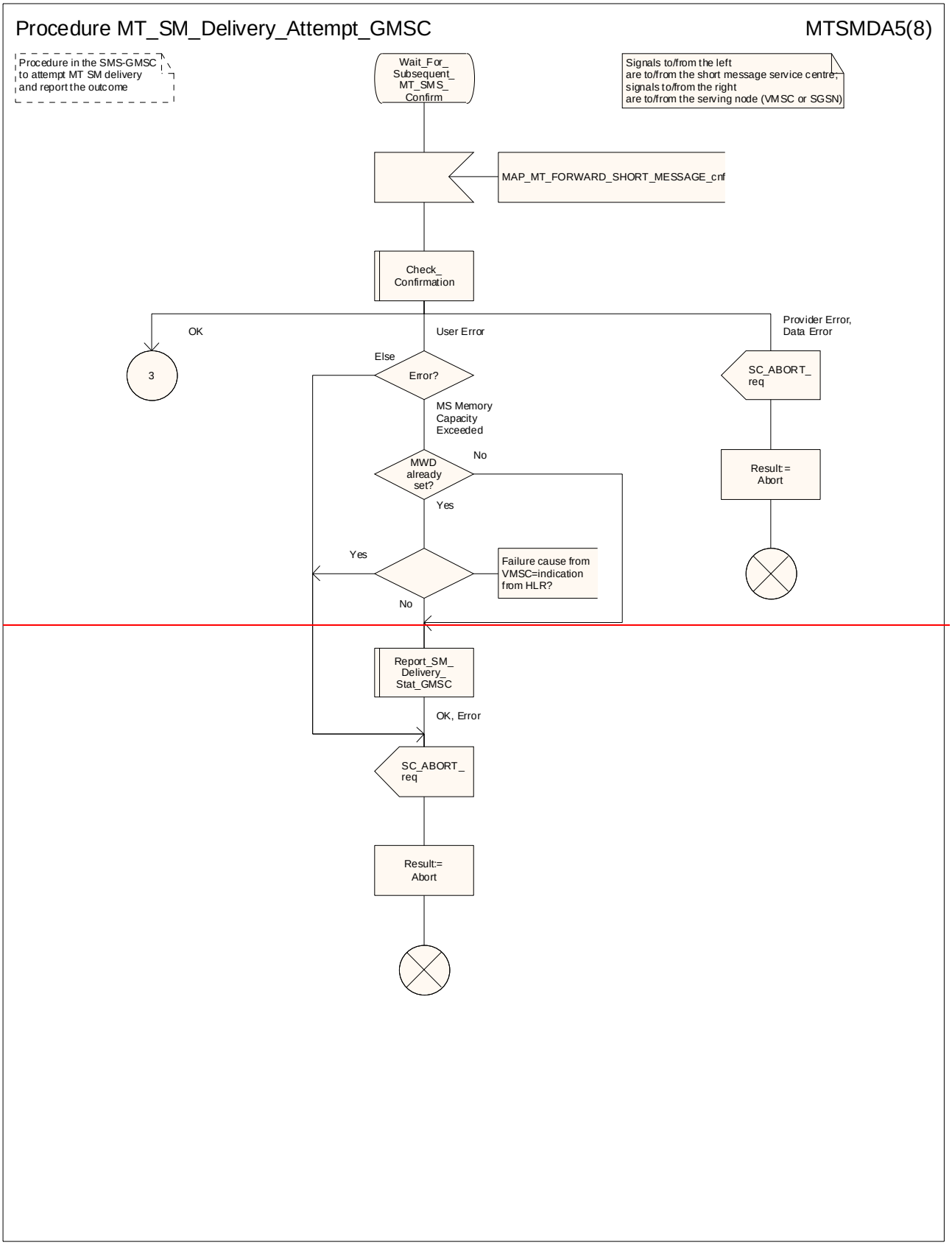
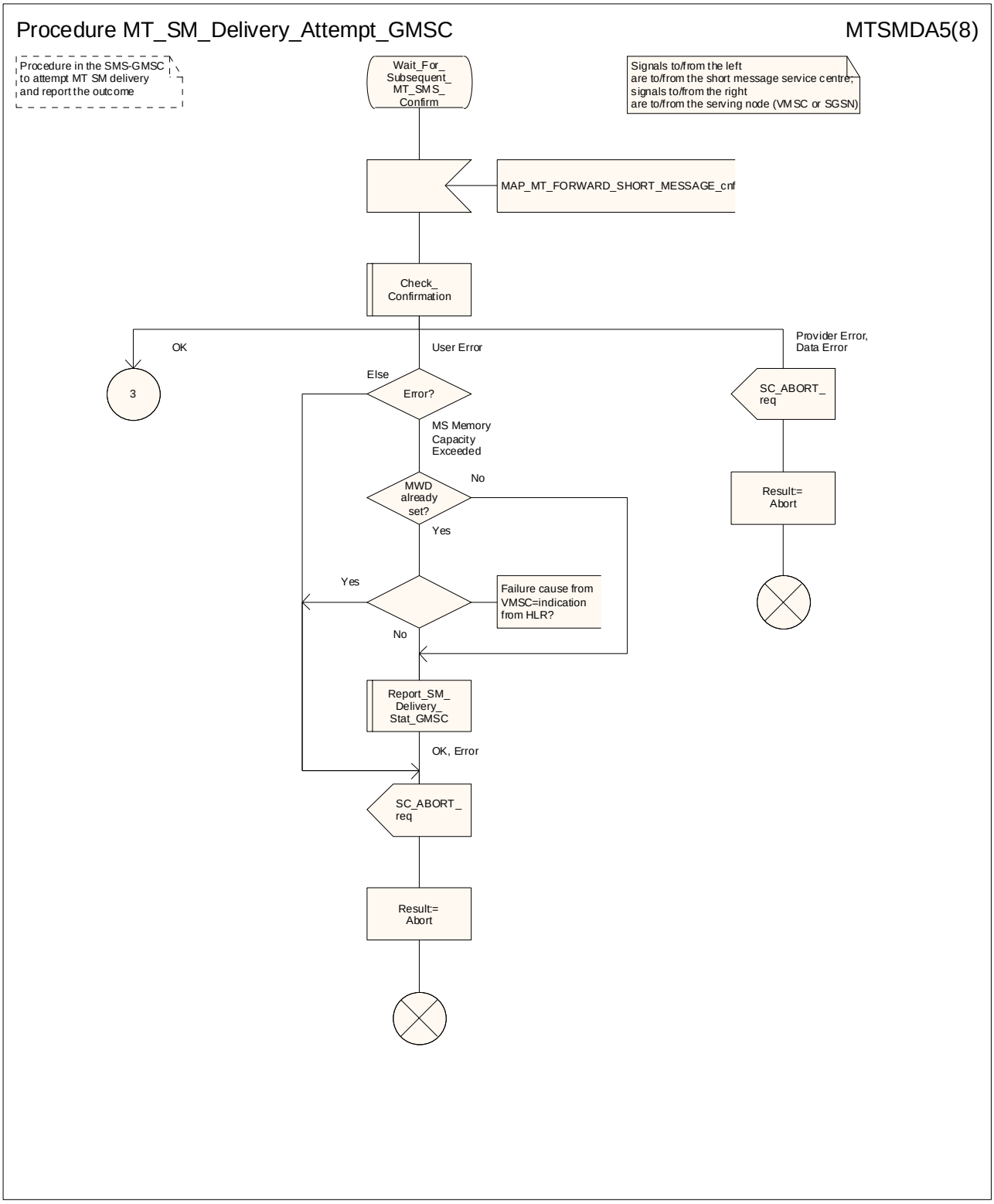


Figure ~~23.3/7a~~23.3/4 (sheet 4 of 8): Procedure MT_SM_Delivery_Attempt_GMSC


Procedure MT_SM_Delivery_Attempt_GMSC
MTSMDA5(8)
Procedure in the SMS-GMSC to attempt MT SM delivery and report the outcome
Wait_For_ Subsequent_ MT_SMS_ Confirm
Signals to/from the left are to/from the short message service centre; signals to/from the right are to/from the serving node (VMSC or SGSN)
MAP_MT_FORWARD_SHORT_MESSAGE_cnf
Check_ Confirmation
OK
User Error
Provider Error, Data Error
3
Else
Error?
SC_ABORT_ req
MS Memory Capacity Exceeded
MWD already set?
No
Result:= Abort
Yes
Yes
Failure cause from VMSC=indication from HLR?
No
Report_SM_ Delivery_ Stat_GMSC
OK, Error
SC_ABORT_ req
Result:= Abort



CR editor's note: the only change to this sheet is the size of the frame!

Figure ~~23.3/7a~~23.3/4 (sheet 5 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

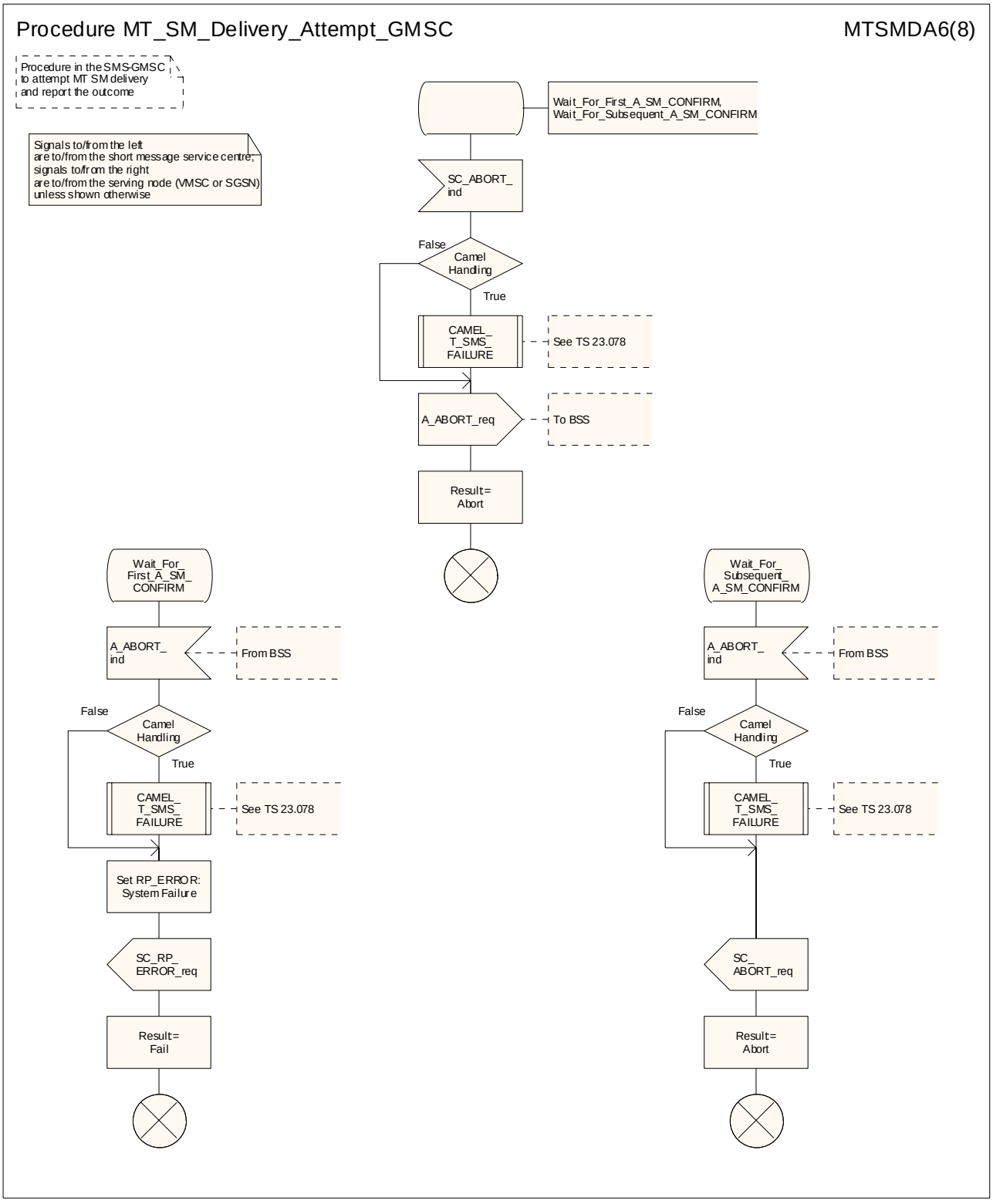
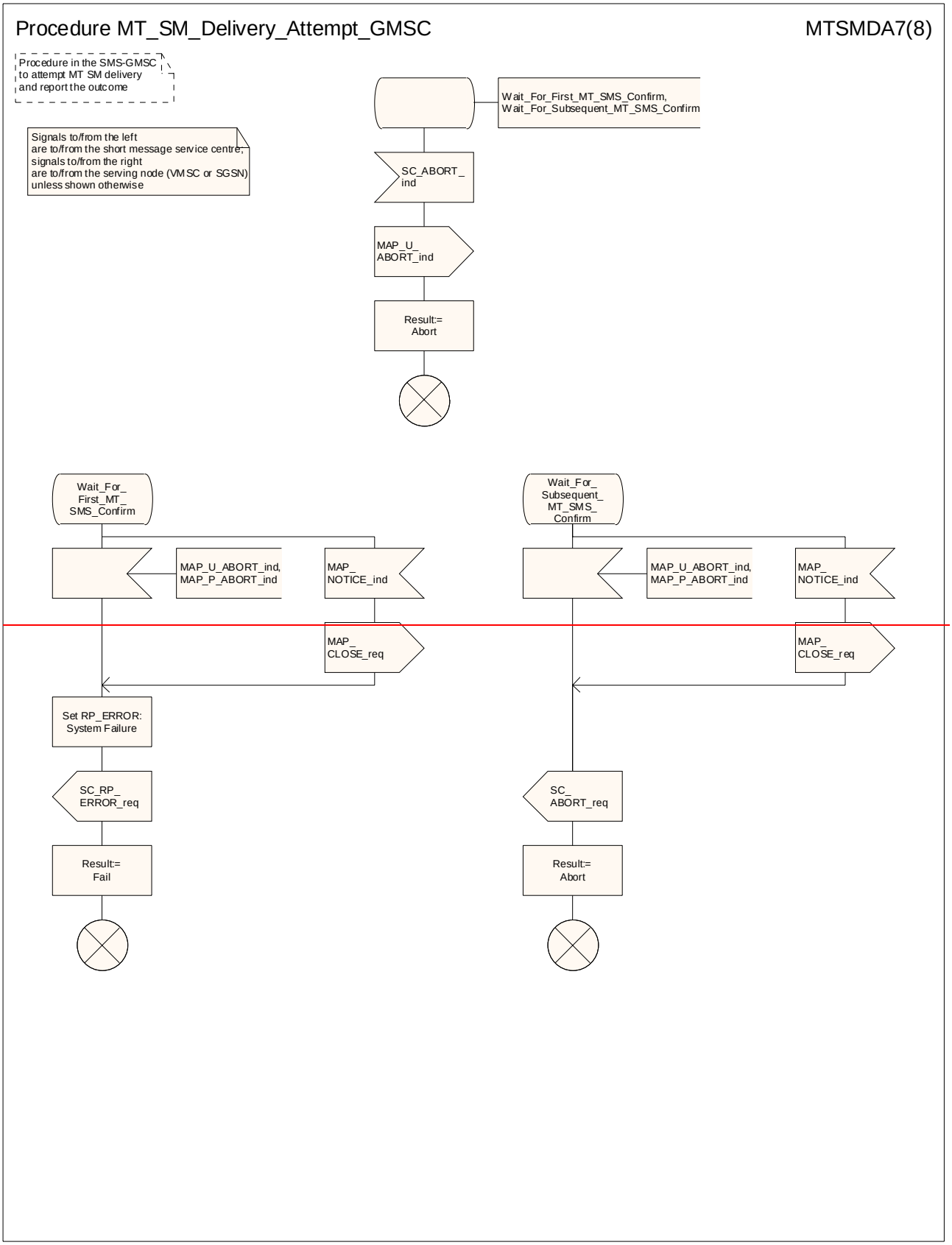
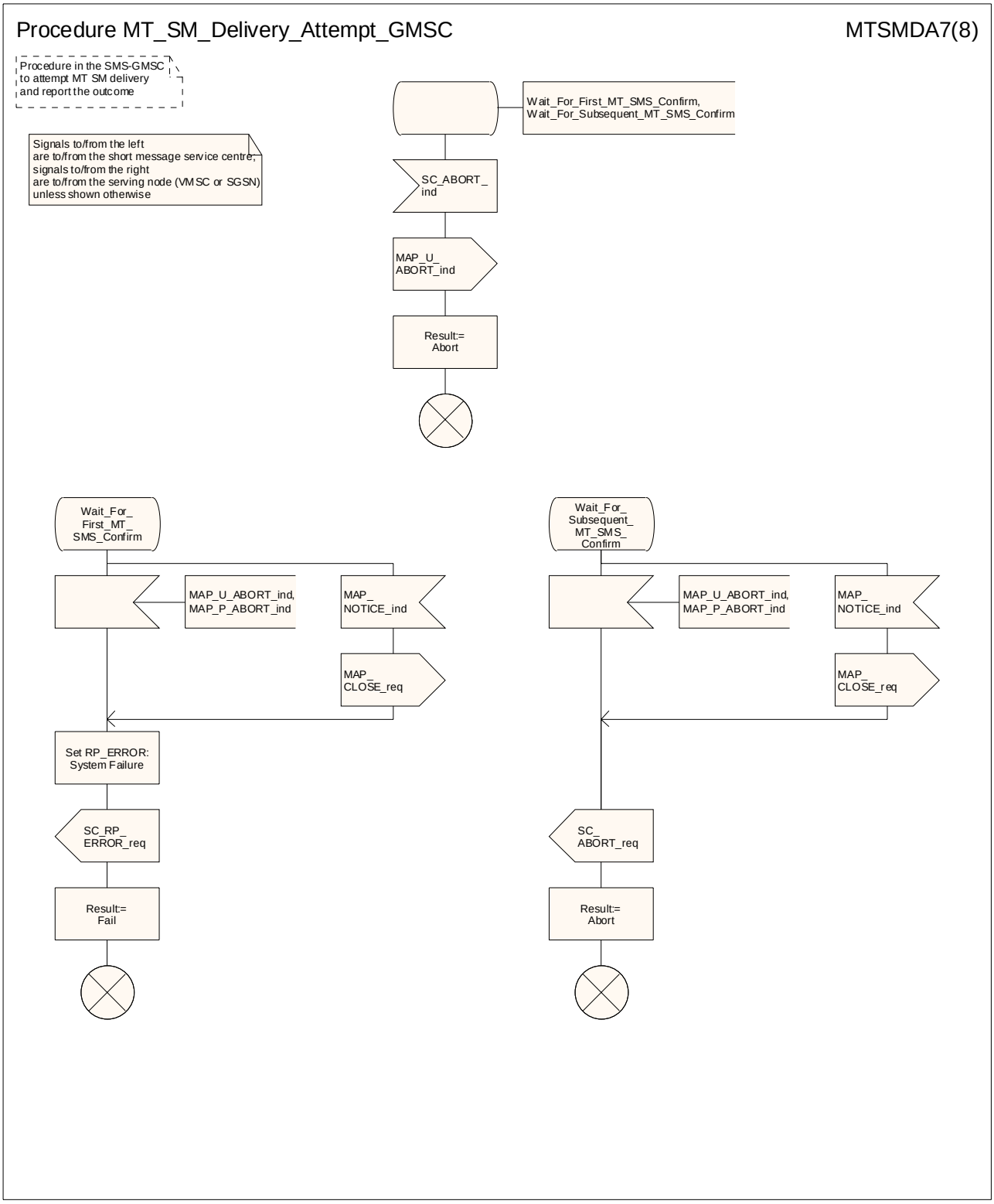


Figure ~~23.3/7a~~23.3/4 (sheet 6 of 8): Procedure MT_SM_Delivery_Attempt_GMSC


Procedure MT_SM_Delivery_Attempt_GMSC
MTSMDA7(8)
Procedure in the SMS-GMSC to attempt MT SM delivery and report the outcome
Signals to/from the left are to/from the short message service centre; signals to/from the right are to/from the serving node (VMSC or SGSN) unless shown otherwise
Wait_For_First_MT_SMS_Confirm, Wait_For_Subsequent_MT_SMS_Confirm
SC_ABORT_ ind
MAP_U_ ABORT_ind
Result:= Abort
Wait_For_ First_MT_ SMS_Confirm
MAP_U_ABORT_ind, MAP_P_ABORT_ind
MAP_ NOTICE_ind
MAP_ CLOSE_req
Set RP_ERROR: System Failure
SC_RP_ ERROR_req
Result:= Fail
Wait_For_ Subsequent_ MT_SMS_ Confirm
MAP_U_ABORT_ind, MAP_P_ABORT_ind
MAP_ NOTICE_ind
MAP_ CLOSE_req
SC_ ABORT_req
Result:= Abort



CR editor's note: the only change to this sheet is the size of the frame!

Figure ~~23.3/7a~~23.3/4 (sheet 7 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

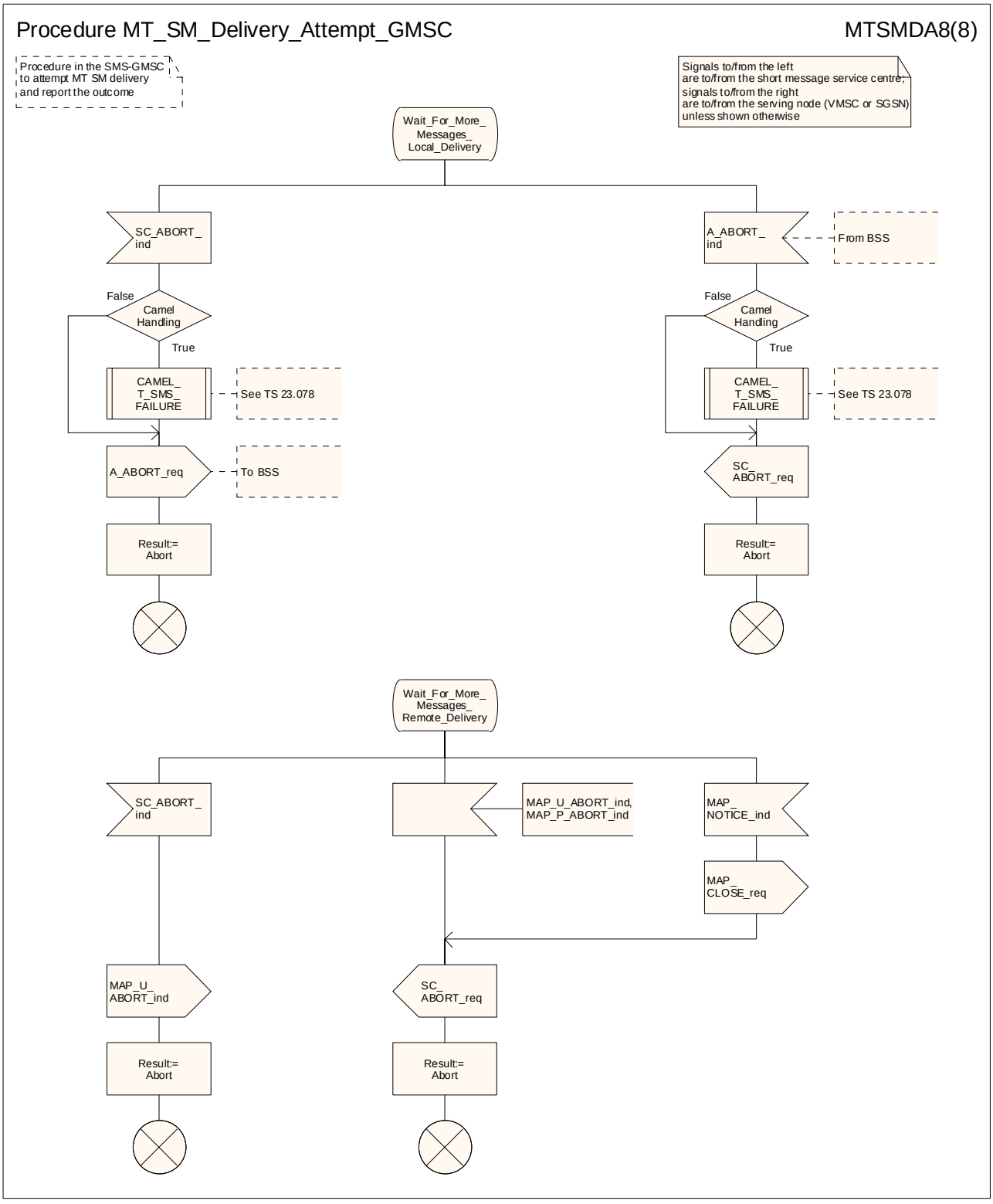


Figure ~~23.3/7a~~23.3/4 (sheet 8 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

23.3.2~~3~~ Procedures in the HLR

The process is triggered by a MAP_SEND_ROUTING_INFO_FOR_SM indication from the SMS-GMSC. For any of the following error cases, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the appropriate user error, closes the dialogue and terminates the process:

~~The MAP_SEND_ROUTING_INFO_FOR_SM indication is received from the GMSC. The following error cases are reported to the GMSC in the MAP_SEND_ROUTING_INFO_FOR_SM response as an unsuccessful outcome of the procedure:~~

- if the indication is badly formed, the HLR returns the appropriate User Error;
- if the mobile subscriber is unknown, i.e. it cannot be identified from the MSISDN given, the HLR returns the User Error "Unknown subscriber";
- if the subscription does not include the MT SMS teleservice, the HLR returns the User Error "Teleservice not provisioned";
- if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";
- if the short message transfer would contravene the "SM filtering by the HPLMN" function criteria, the HLR returns the User Error "Call barred" with cause "Unauthorised Message Originator". The definition of the filtering function is out of the scope of UMTS specifications. Filtering may be based on the SM-RP-SMEA information element if it is received from the SMS-GMSC;
- depending on the Network Access Mode ("Non-GPRS", "GPRS" or "Non-GPRS and GPRS"), the HLR behaves as follows:
  - if the Network Access Mode is "Non-GPRS", i.e. the subscriber is not a GPRS subscriber, then:
    - if the MS is not reachable in an MSC, i.e. no MSC identity is stored for the mobile subscriber or the "MSC Area Restricted Flag" is set or the "MS purged for non GPRS" flag is set, the HLR sets the MNRF and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic, i.e. "Deregistered in HLR for non GPRS", "Roaming Restricted" or "MS-Purged for non GPRS". The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";
    - if the MSC where the subscriber is registered does not support MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;
    - if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";
    - if the short message transfer would contravene supplementary service barring, the HLR returns the User Error "Call barred" with cause "Barring service active";
    - if the MNRF is set, the HLR checks whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication. If the priority information element was present, the HLR sets the "mnrf-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true". If the priority information element was not present, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for non-GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";
    - if the MNRF is not set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".
  - if the Network Access Mode is "GPRS", i.e. the subscriber is a GPRS subscriber, then:

- if the MS is not reachable in an SGSN, i.e. no MSC identity is stored for the mobile subscriber or the "SGSN Area Restricted Flag" is set or the "MS purged for GPRS" flag is set, the HLR sets the MNRG flag and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the SGSN where the subscriber is registered does not support MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;

- if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";

- if the MNRG flag is set, the HLR checks whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication. If the priority information element was present, the HLR sets the "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. If the SMS-GMSC did not indicate in the MAP_SEND_ROUTING_INFO_FOR_SM indication that it supports GPRS functionality (i.e. it can handle two routeing addresses in the MAP_SEND_ROUTING_INFO_FOR_SM response), the HLR maps the state of the MNRG flag into the "mnrf-Set" bit of the mw-Status parameter.

NOTE: If the SMS-GMSC does not support GPRS functionality, it uses the protocol defined in the Release 96 version of the specification. The parameter "msc-Number" in "RoutingInfoForSM-Res" in the Release 96 version of the protocol definition corresponds to the parameter "networkNode-Number" in "RoutingInfoForSM-Res" in the Release 97 (and later) version of the protocol definition; therefore if the HLR populates the parameter "networkNode-Number" with the SGSN number, the Release 96 SMS-GMSC will interpret the SGSN number as an MSC number. If the HLR populates the "gprsNodeIndicator" parameter in the MAP_SEND_ROUTING_INFO_FOR_SM response, a Release 96 SMS-GMSC will silently discard the parameter.

The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the priority information element was not present, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the MNRG flag is not set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".

- if the Network Access Mode is "Non-GPRS and GPRS", i.e. the subscriber is a non-GPRS and GPRS subscriber, then:

- the HLR checks whether the SMS-GMSC supports GPRS functionality, i.e. it can handle two routeing addresses in the MAP_SEND_ROUTING_INFO_FOR_SM response;

- if the SMS-GMSC does not support GPRS functionality then:

- if the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the MSC", the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

- if the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the SGSN", the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS".

- if the SMS-GMSC supports GPRS functionality then:

- if the MS is not reachable in an MSC (see the definition above under Network Access Mode "Non-GPRS") and not reachable in an SGSN (see the definition above under Network Access Mode

"GPRS"), the HLR sets the MNRF and the MNRG flag and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the MS is not reachable in an SGSN (see the definition above under Network Access Mode "GPRS") but is reachable in an MSC, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

- if the MS is not reachable in an MSC (see the definition above under Network Access Mode "Non-GPRS") but is reachable in an SGSN, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS";

- if the MS is reachable in both an MSC and an SGSN, the HLR continues as described below;

- if neither the MSC nor the SGSN where the subscriber is registered supports MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;

- if only the MSC where the subscriber is registered supports MT SMS, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

- if only the SGSN where the subscriber is registered supports MT SMS, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS";

- if both the MSC and the SGSN where the subscriber is registered support MT SMS, the HLR checks whether the short message transfer would contravene operator determined barring or supplementary service barring.

- if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";

- if the short message transfer would contravene supplementary service barring, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

NOTE: supplementary service barring is specified to apply only for SMS transfer via an MSC, not for SMS transfer via an SGSN.

- if the short message transfer is not prevented by operator determined barring or supplementary service barring, the HLR checks the states of the MNRF and the MNRG flag, and whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication.

- if both the the MNRF and the MNRG flag are set and the priority information element was absent, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for non-GPRS or GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if one or both of the MNRF and the MNRG flag is set and the priority information element was present, the HLR sets the "mnrf-Set", "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number and SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the MNRG flag is set but the the priority information element was absent, the HLR sets the "mnrf-Set", "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the

MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the MNRF is set but the the priority information element was absent, the HLR sets the "mnrf-Set", "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if neither the MNRF nor the MNRG flag is set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number and SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".

Addition of the Service Centre Address to the MWD list

The HLR checks whether the service centre address is included in the Message Waiting Data (MWD) list.

- if the service centre address is not in the MWD list, the HLR attempts to add the service centre address. If it was not possible to add the service centre address to the MWD list (e.g. because the MWD list was full), the HLR sets the MWD status to show that the service centre address was not included, otherwise the HLR sets the MWD status to show that the service centre address was included;

- if the service centre address is in the MWD list, the HLR sets the MWD status to show that the service centre address was included.

The HLR then checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request.

The HLR then sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

Return of Routeing Information because the SM-RP-Priority is true

The HLR checks whether the service centre address is included in the Message Waiting Data (MWD) list.

- if the service centre address is not in the MWD list, the HLR sets the MWD status to show that the service centre address was not included;

- if the service centre address is in the MWD list, the HLR sets the MWD status to show that the service centre address was included.

The HLR then checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request.

The HLR then sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

Return of Routeing Information – normal case

The HLR checks the MCEF.

- if the MCEF is set, the HLR:

  - sets the "mcef-Set" bit of the mw-Status parameter;

  - checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request;

  - sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

- if the MCEF is not set, the HLR:

- checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sends to the SMS-GMSC a MAP_INFORM_SERVICE_CENTRE request including the MSISDN-Alert parameter;

- closes the MAP dialogue and terminates the process.

Use of LMSI

If the HLR received a LMSI from the VLR at location updating, it shall include the LMSI in the MAP_SEND_ROUTING_INFO_FOR_SM response only if the MAP_SEND_ROUTING_INFO_FOR_SM response also includes the MSC number.

- ~~if the necessary parameters and data are not present in the primitive or they are badly formatted, the data missing or unexpected data value error is returned;~~

- ~~if the mobile subscriber is unknown, i.e. it cannot be identified from the MSISDN given, an unknown subscriber error is returned;~~

- ~~if the short message transfer would contravene operator determined barring, the call barred error with cause operator barring is returned;~~

- ~~if the short message transfer would contravene the « SM filtering by the HPLMN » function criteria, the call barred error with cause unauthorised Message Originator is returned (the definition of the filtering function is out of the scope of GSM specification. Filtering may be based on SM-RP-SMEA information element if received from the GMSC);~~

- ~~if the mobile subscription identified by the given MSISDN number does not include the short message service, the teleservice not provisioned error is returned;~~

- ~~if the GMSC does not support the GPRS functionality, the behaviour of the HLR depends on the following conditions:~~

  - ~~if the subscriber is not a GPRS subscriber then the behaviour of the HLR shall be the same as for a subscriber only registered as non GPRS and for SMS delivery;~~

  - ~~if the subscriber is a GPRS subscriber and a non GPRS subscriber with the option « transfer of SM via the MSC when GPRS is not supported in the GMSC » then the behaviour of the HLR shall be the same as for a subscriber only registered as non GPRS and for SMS delivery;~~

  - ~~if the subscriber is a GPRS subscriber and a non GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only then the behaviour of the HLR shall be the same as for the case transfer over GPRS described in MAP release 97, with the following precision: because GMSC does not support MAP release 97, the previous MAP protocol release is used. When the HLR sends the MAP_SEND_ROUTING_INFO_FOR_SM_Resp, the SGSN number is mapped to the MAP parameter « MSC number ». When the HLR sends the MAP_INFORM_SERVICE_CENTRE_resp, the MNRG status shall be mapped to the MAP parameter « mnrf set ».~~

~~The HLR may send the MSC, SGSN or both numbers as routing information to SMS-GMSC based on the following:~~

~~A) The subscriber may only be registered as non GPRS and for SMS delivery:~~

- ~~if the short message transfer would contravene the supplementary service barring, the call barred error with cause barring service active is returned;~~

- ~~if the location registration of the mobile subscriber shows that the VLR in the visited PLMN does not support the MT short message service, the facility not supported error is returned;~~

- ~~if no MSC identity is stored for the mobile subscriber or the "MSC Area Restricted Flag" is set or the "MS purged for non GPRS" flag is set, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flag MNRF is set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for non GPRS ', 'Roaming Restricted' or 'MS Purged for non GPRS '.~~

The priority parameter (SM_RP_PRI) is processed as follows:

- if the priority is low (SM_RP_PRI = False) and the mobile station not reachable flag (MNRF) is set, an absent subscriber_SM error is returned. If a reason for the subscriber's absence for non GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, then this is returned with the absent subscriber_SM error. The SC address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.

- if the priority is low (SM_RP_PRI = False), and the MNRF is clear, the routing information with MSC number is retrieved as described below;

- if the priority is high (SM_RP_PRI = True) and the MNRF is set, the HLR will send the acknowledge primitive containing the routing information with MSC number to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.

B) The subscriber may only be registered as GPRS and for SMS delivery:

- if the location registration of the mobile subscriber shows that the SGSN in the visited PLMN does not support the MT short message service, the facility not supported error is returned;

- if no SGSN identity is stored for the mobile subscriber or the "SGSN Area Restricted Flag" is set or the "MS purged for GPRS" flag is set, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flag MNRG is set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for GPRS', 'Roaming Restricted' or 'MS Purged for GPRS '.

The priority parameter (SM_RP_PRI) is processed as follows:

- if the priority is low (SM_RP_PRI = False) and the mobile station not reachable for GPRS (MNRG) flag is set, an absent subscriber_SM error is returned. If a reason for the subscriber's absence for GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, then this is returned with the absent subscriber_SM error. The SC address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.

- if the priority is low (SM_RP_PRI = False), and the MNRG is clear, the routing information with SGSN number is retrieved as described below;

- if the priority is high (SM_RP_PRI = True) and the MNRG is set, the HLR will send the acknowledge primitive containing the routing information with SGSN number to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.

C) The subscriber may be registered as non GPRS and GPRS and for SMS Delivery:

- if the short message transfer would contravene the supplementary service barring, the behaviour is the same as for a subscriber only registered for GPRS and SMS delivery.

- if the location registration of the mobile subscriber shows that the VLR in the visited PLMN does not support the MT short message service, the behaviour is the same as for a subscriber only registered for GPRS and SMS delivery;

- if the location registration of the mobile subscriber shows that the SGSN in the visited PLMN does not support the MT short message service, the behaviour is the same as for a subscriber only registered for non GPRS and SMS delivery;

- if no MSC and SGSN identities are stored for the mobile subscriber or the "MSC and SGSN Area Restricted Flags" are set or the "MS purged for non GPRS and GPRS" flags are set or a combination of these errors for non GPRS and GPRS are used, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flags MNRF and MNRG are set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for non GPRS or GPRS', 'Roaming Restricted', 'MS Purged for non GPRS or GPRS' or both.

~~The priority parameter (SM_RP_PRI) is processed as follows:~~

- ~~if the priority is low (SM_RP_PRI = False), the MNRF and MNRG are set, an absent subscriber_SM error is returned. If reasons for the subscriber's absence for non GPRS and GPRS are stored in MNRR in the subscriber data, then this is returned with the absent subscriber_SM error. The SC address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.~~

- ~~if the priority is low (SM_RP_PRI = False), and the MNRF is clear and MNRG is set, the routing information with MSC number is retrieved as described below;~~

- ~~if the priority is low (SM_RP_PRI = False), and the MNRF is set and MNRG is clear, the routing information with SGSN number is retrieved as described below;~~

- ~~if the priority is low (SM_RP_PRI = False), and the MNRF and MNRG are clear, the routing information with MSC and SGSN numbers is retrieved as described below;~~

- ~~if the priority is high (SM_RP_PRI = True) and the MNRF, the MNRG or both are set, the HLR will send the acknowledge primitive containing the routeing information with both MSC and SGSN numbers to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.~~

~~If the MSISDN-Alert number of the mobile subscriber stored in the MWD is not the same as that received in the MAP_SEND_ROUTING_INFO_FOR_SM indication, the HLR will include in the MAP_INFORM_SERVICE_CENTRE request to the GMSC the MSISDN-Alert number stored.~~

~~The MAP_INFORM_SERVICE_CENTRE request is sent also when the MCEF, MNRF, MNRG or both are set but the routing information is still sent to the GMSC. The status of the flags is indicated in the parameter MW Status.~~

~~The routing information is included in a MAP_SEND_ROUTING_INFO_FOR_SM response as follows:~~

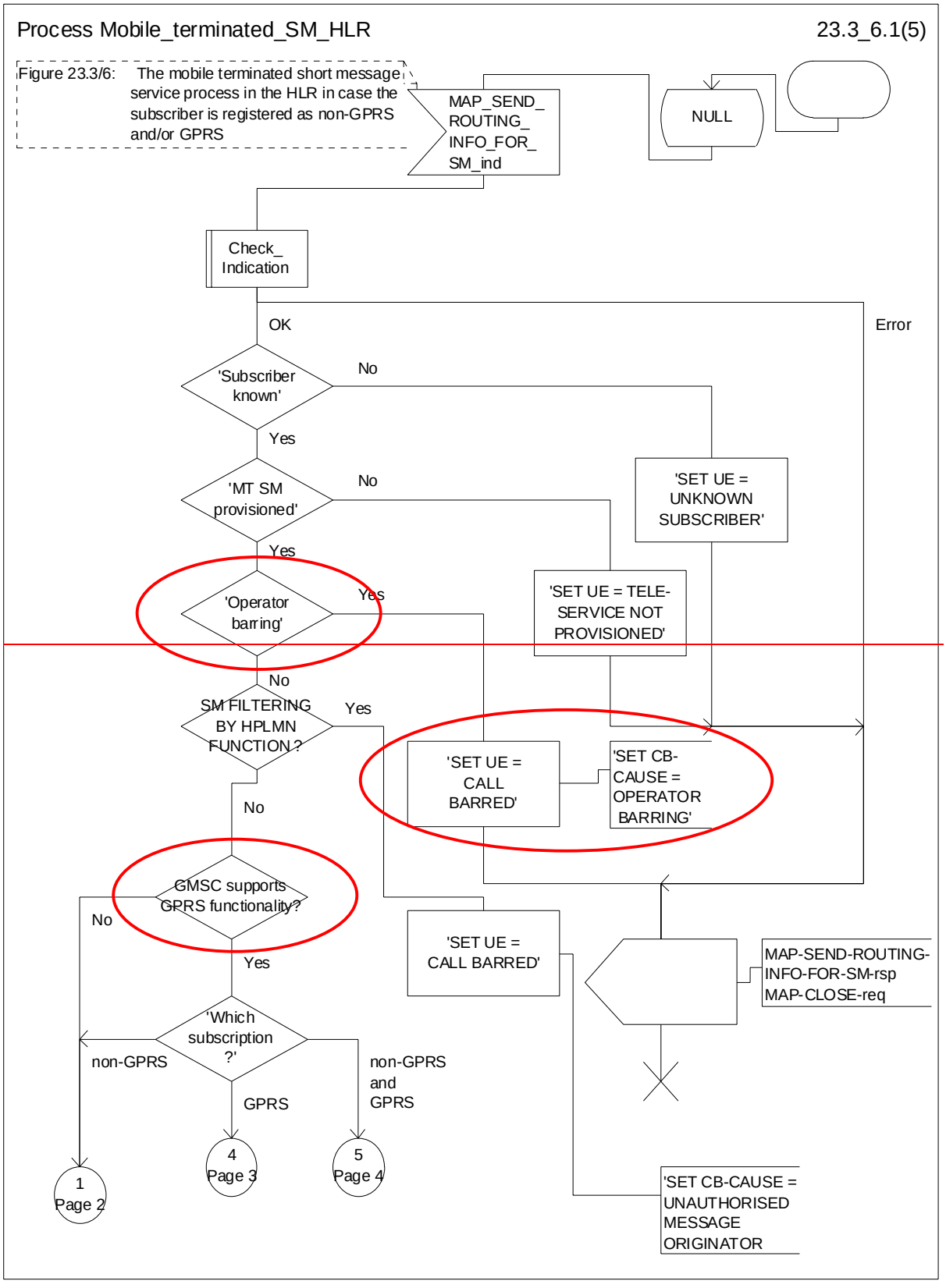
- ~~the IMSI will be returned to the GMSC together with the MSC, SGSN or both numbers and may be optionally accompanied by the LMSI.~~

- ~~an indication specifying which number belongs the MSC and the SGSN will be returned to the GSMC.~~

~~LMSI shall not be used in case only the SGSN number is sent by HLR.~~

The mobile terminated short message transfer proces~~s~~s~~dure~~ in the HLR is shown in figure 23.3/5~~6~~.

CR editor's note: the material in the SDL diagrams has undergone major **editorial** rearrangement. The handling of the output signals on the old sheets 2, 3 & 4 has been moved to the new sheet 4, together with the handling on the old sheet 5. The intention of this rearrangement is to improve the presentation, with no technical impact.


Process Mobile_terminated_SM_HLR
23.3_6.1(5)
Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS
MAP_SEND_ROUTING_INFO_FOR_SM_ind
NULL
Check_Indication
OK
Error
'Subscriber known'
No
Yes
'MT SM provisioned'
No
Yes
'SET UE = UNKNOWN SUBSCRIBER'
'Operator barring'
Yes
'SET UE = TELE-SERVICE NOT PROVISIONED'
No
SM FILTERING BY HPLMN FUNCTION ?
Yes
'SET UE = CALL BARRED'
'SET CB-CAUSE = OPERATOR BARRING'
No
GMSC supports GPRS functionality?
No
Yes
'SET UE = CALL BARRED'
MAP-SEND-ROUTING-INFO-FOR-SM-rsp
MAP-CLOSE-req
'Which subscription ?'
non-GPRS
GPRS
non-GPRS and GPRS
1 Page 2
4 Page 3
5 Page 4
'SET CB-CAUSE = UNAUTHORISED MESSAGE ORIGINATOR

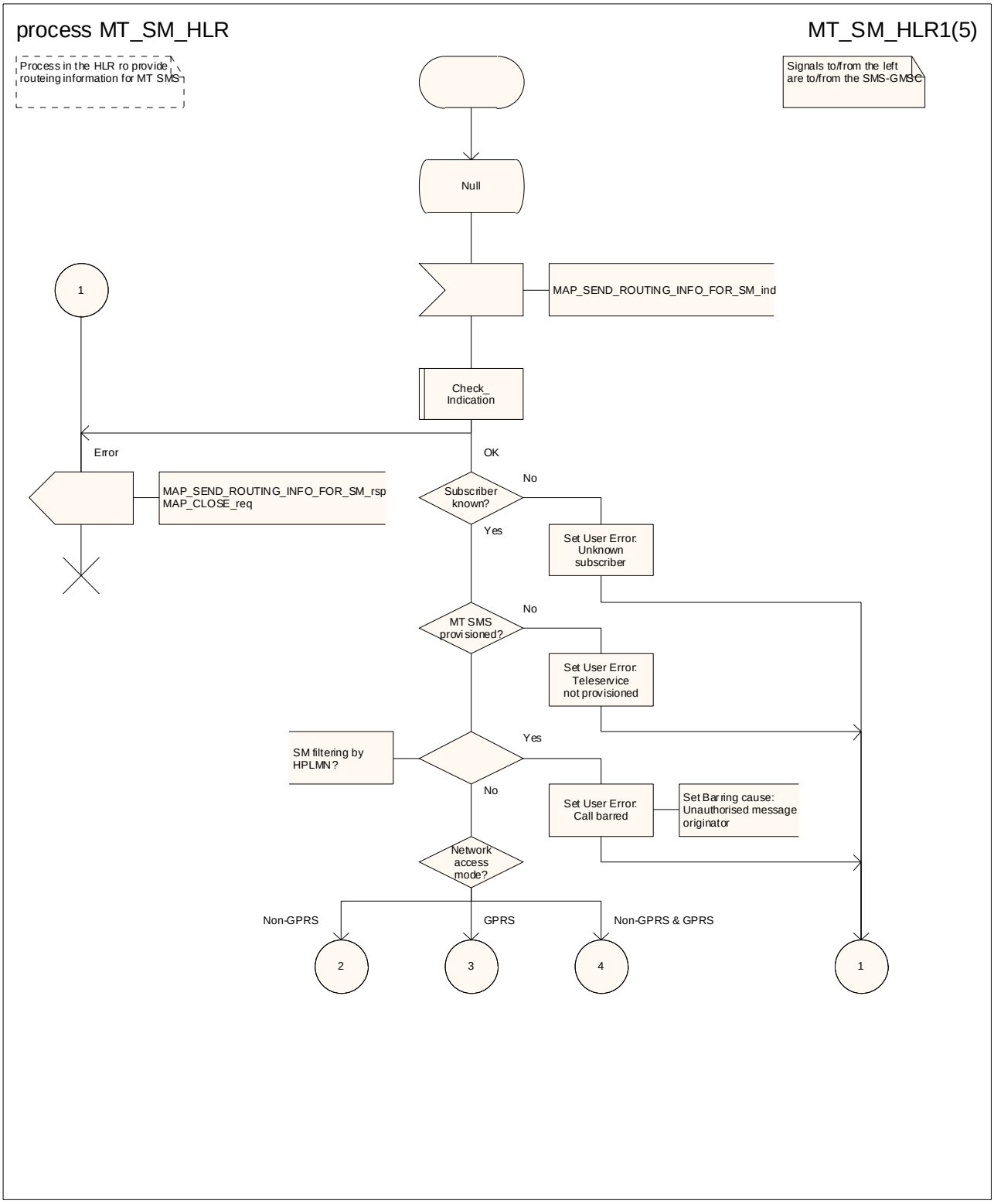


Figure 23.3/56 (sheet 1 of 5): Process MTobile_terminated _SM_HLR

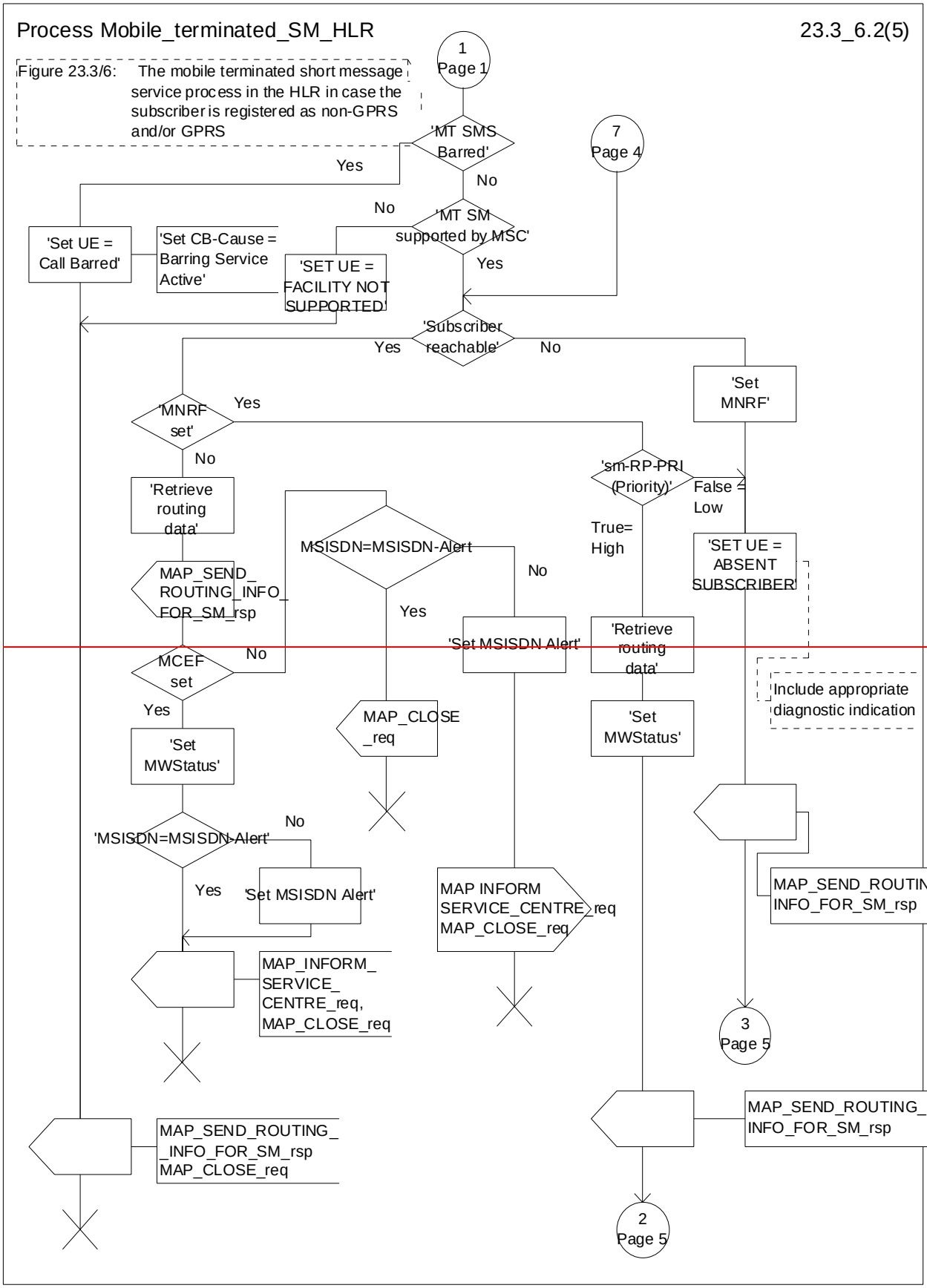


Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

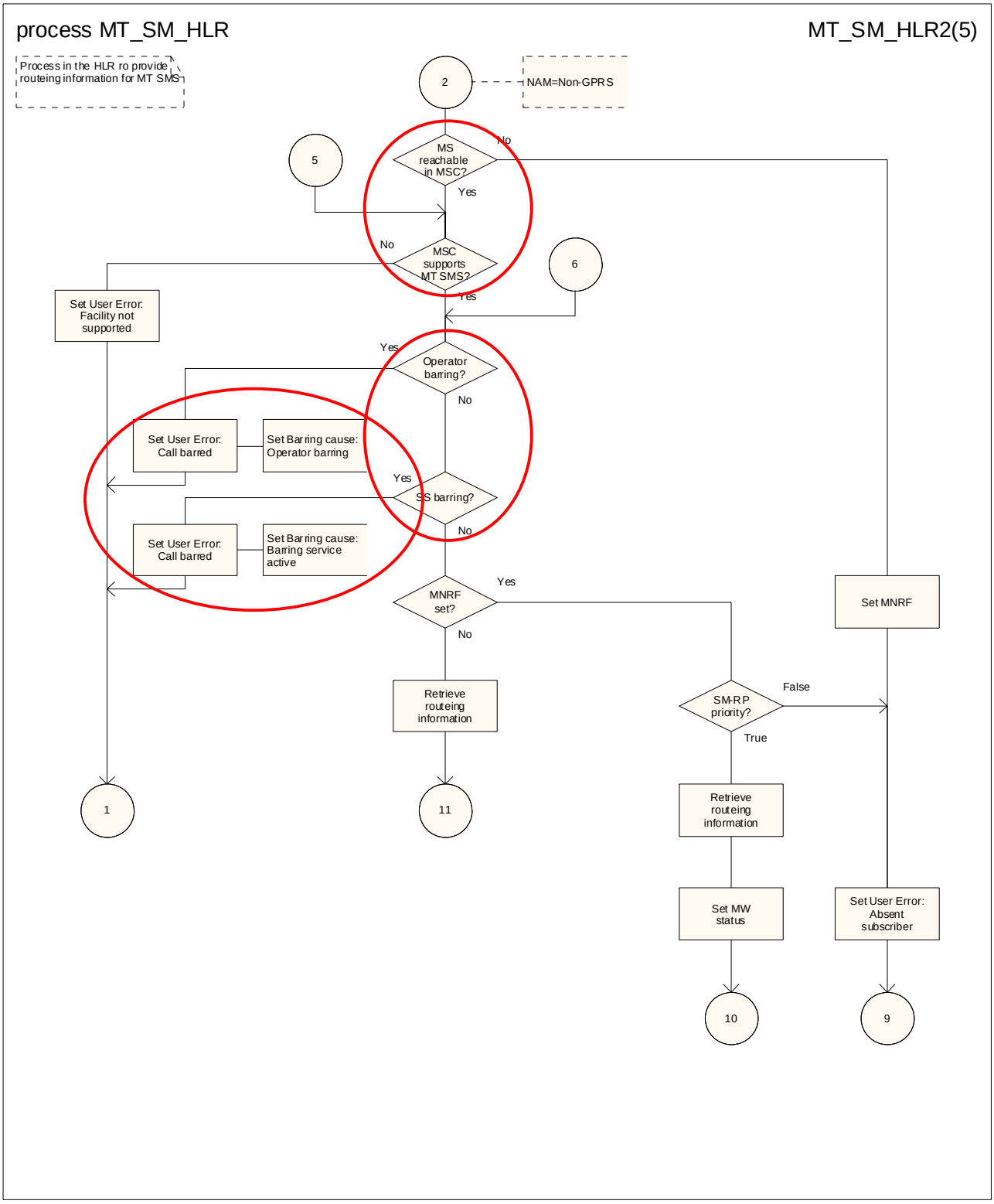


Figure 23.3/56 (sheet 2 of 5): Process MTobile_terminated _SM_HLR

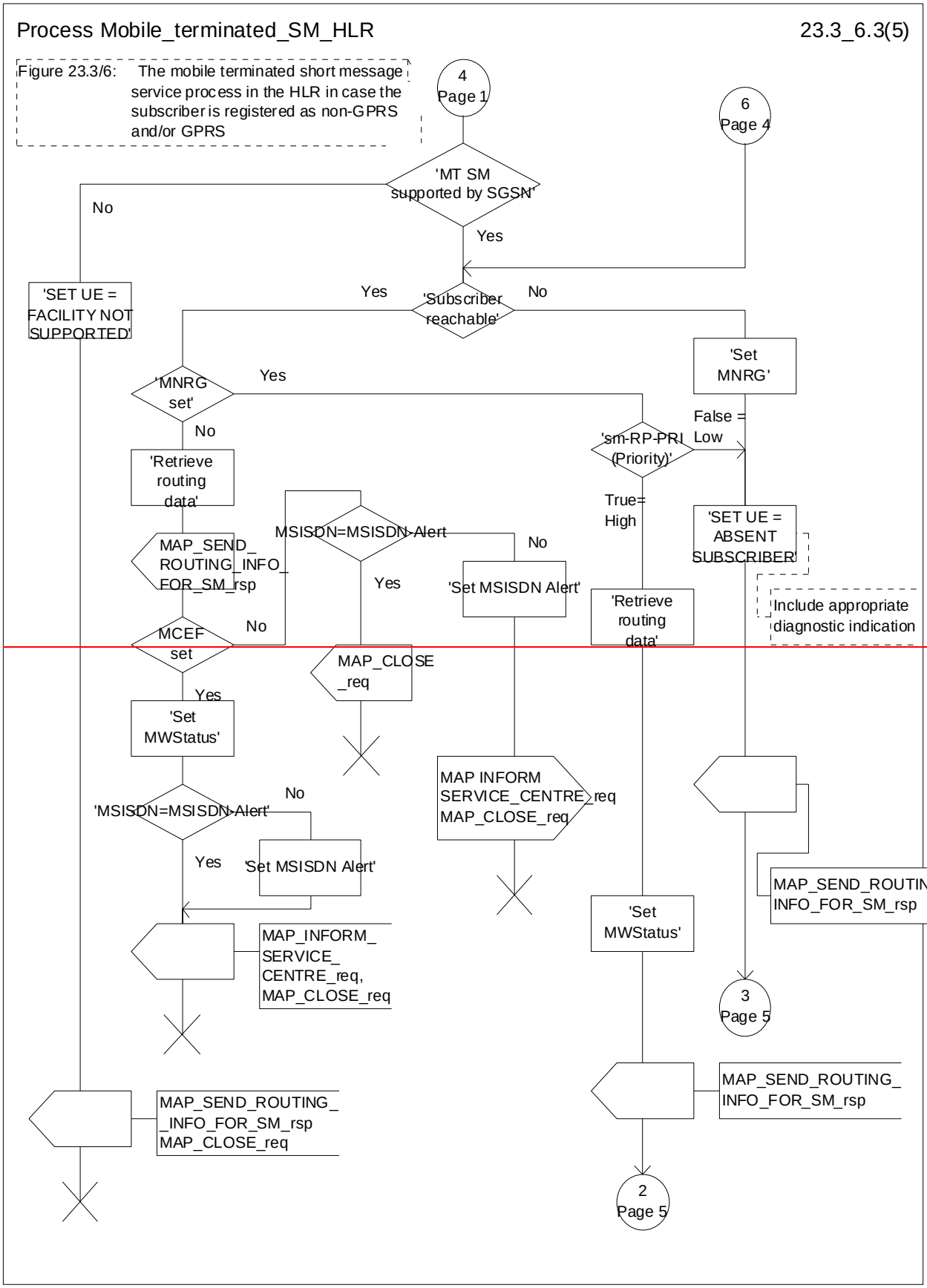


Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

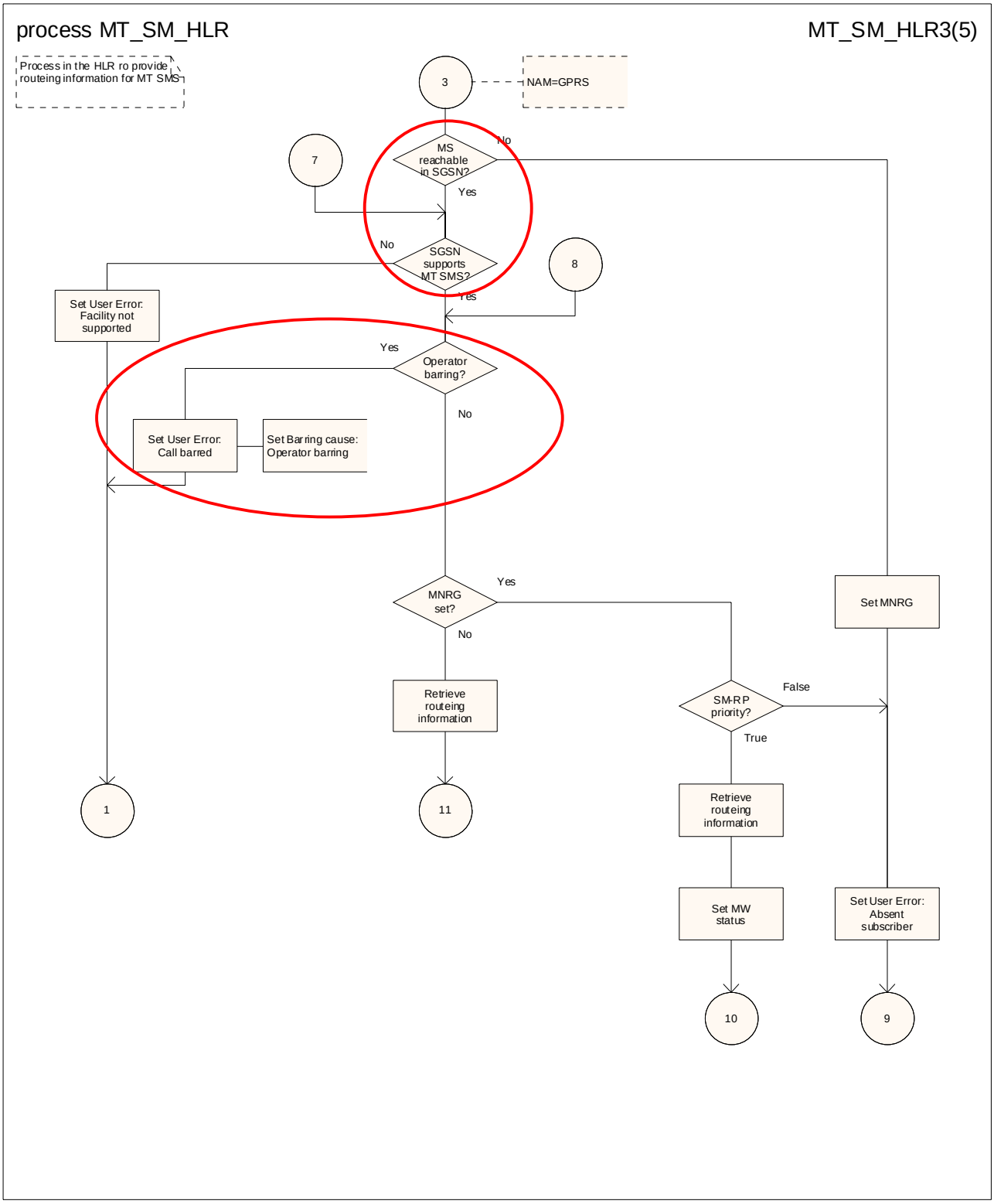


Figure 23.3/56 (sheet 3 of 5): Process MTobile_terminated _SM_HLR

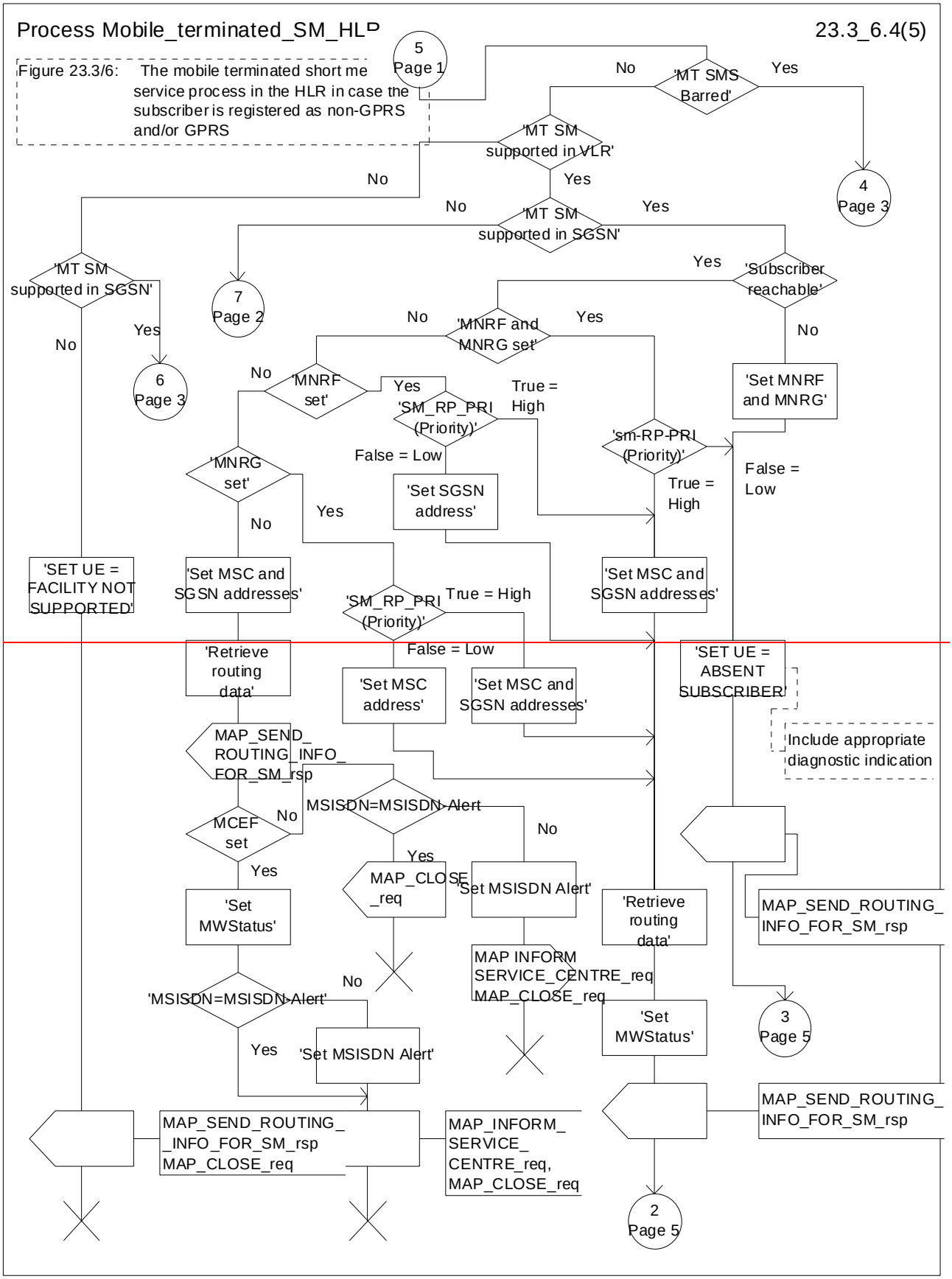


Figure 23.3/6: The mobile terminated short me service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

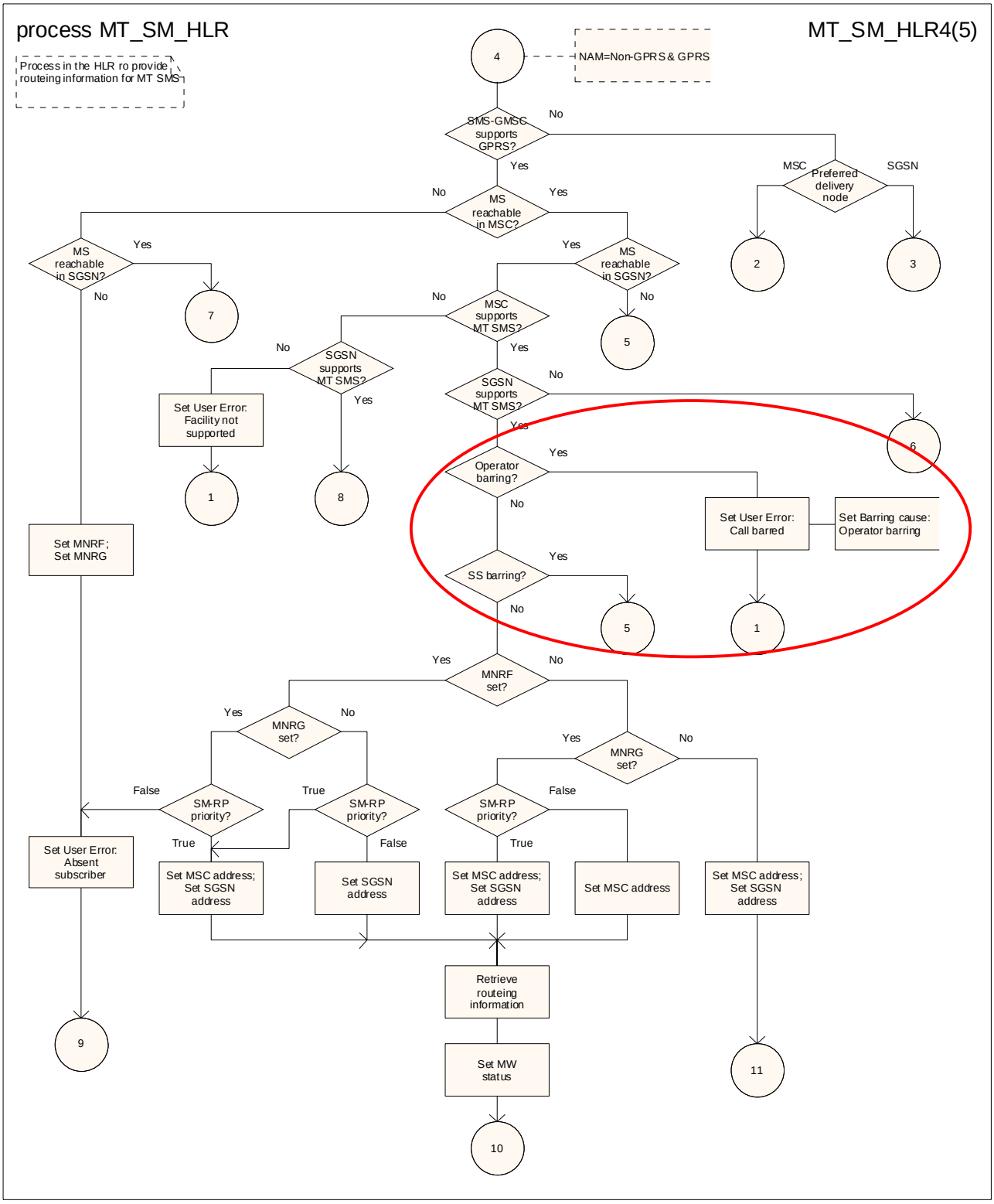
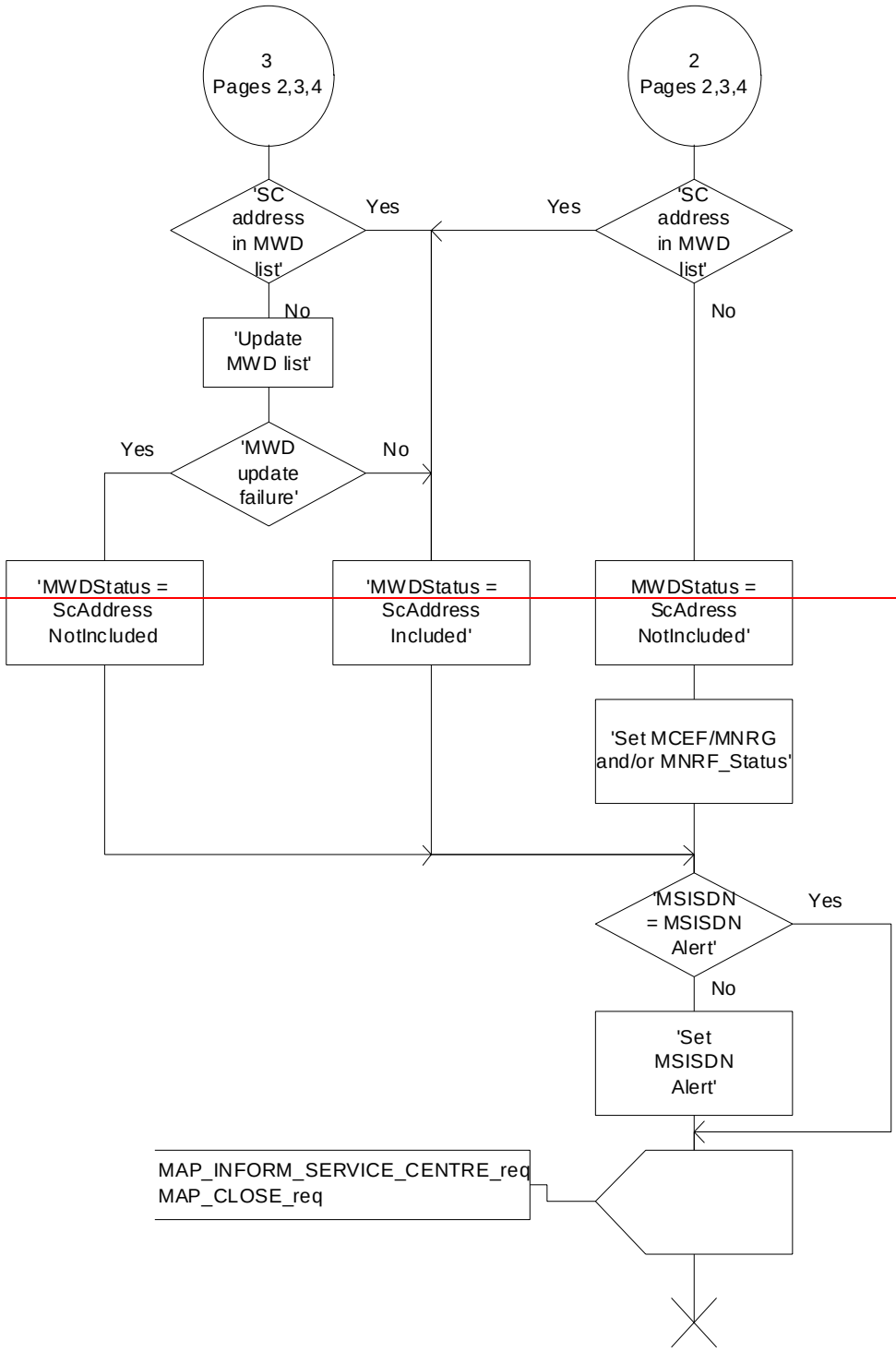


Figure 23.3/5~~6~~ (sheet 4 of 5): Process MT~~obile_terminated~~_SM_HLR

Process Mobile_terminated_SM_HLR 23.3_6.5(5)

Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS



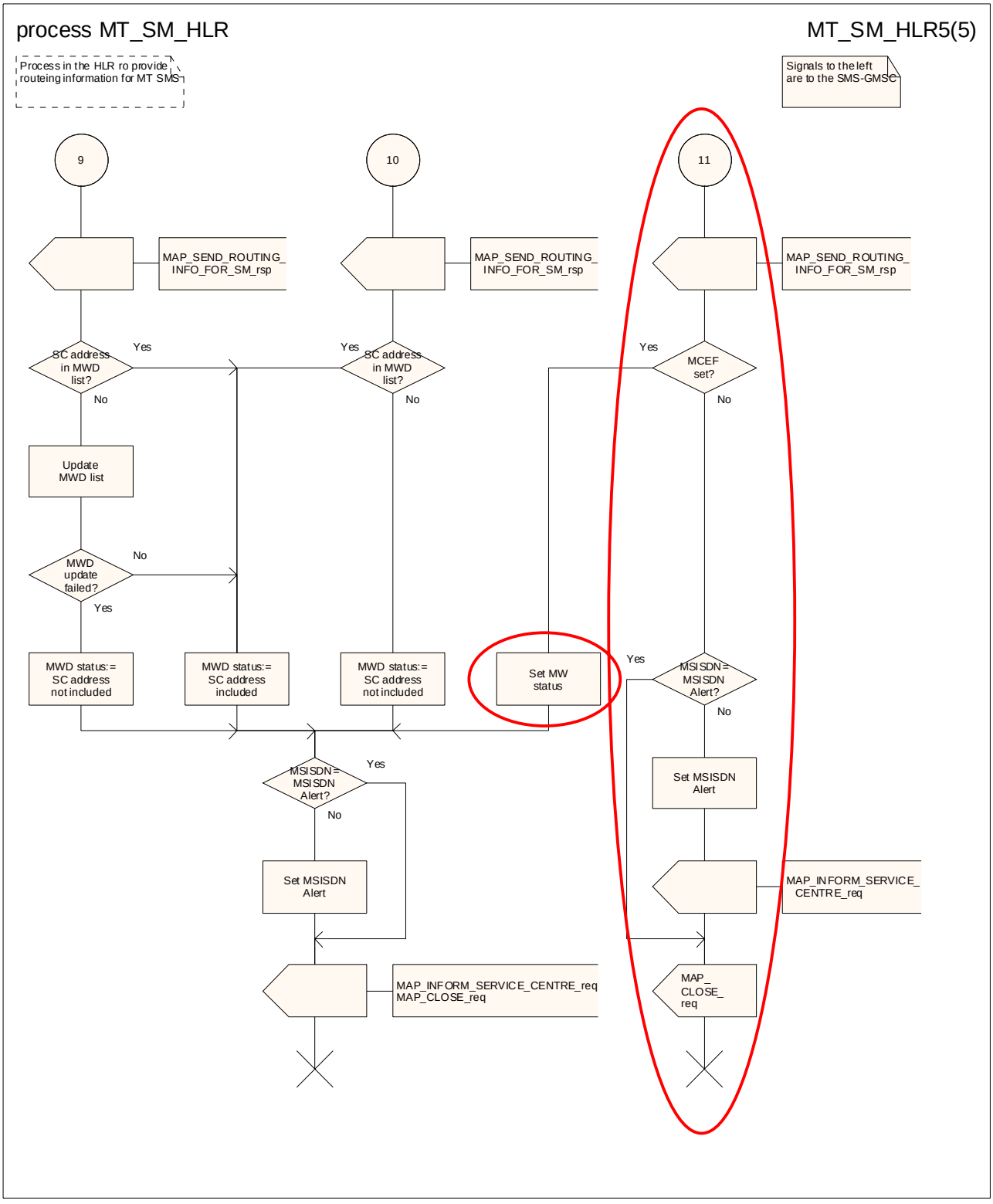
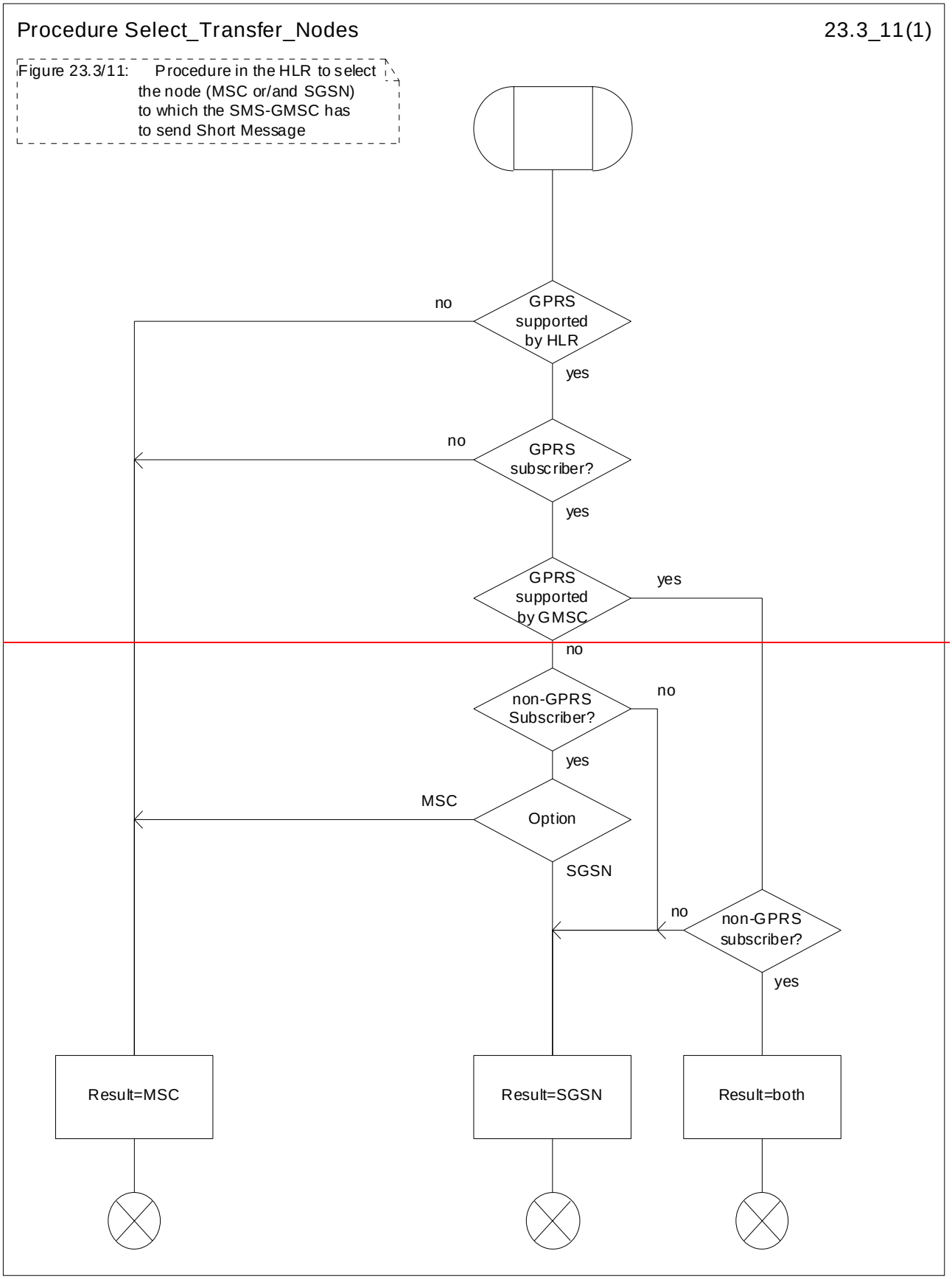


Figure 23.3/56 (sheet 5 of 5): Process MTobile_terminated_SM_HLR



~~Figure 23.3/11: Procedure Select_Transfer_Nodes~~

23.3.31 Procedure in the Serving MSC

Any CAMEL-specific handling defined in this subclause is omitted if the MSC does not support CAMEL control of MT SMS, or if the subscriber does not have a subscription for CAMEL control of MT SMS.

The process is triggered by a dialogue opening request with the application context shortMsgMT-RelayContext.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the MSC checks whether the dialogue opening request included a destination reference. If a destination reference was included, the MSC stores it and waits for a service primitive.
  - if the dialogue with the SMS-GMSC fails, the process returns to the Null state;
  - if the next primitive received is a MAP_DELIMITER indication, the MSC returns a MAP_DELIMITER request, and waits for a service primitive;
  - if the next primitive received is a MAP_MT_FORWARD_SHORT_MESSAGE indication, the MSC checks the indication.
    - if the indication is badly formed, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
    - if the indication is OK, the MSC invokes the macro MT_SM_Transfer_MSC to transfer the short message to the MS.
      - if the macro takes the "Release SMS" exit, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
      - if the macro takes the "Error" exit, the MSC reports the delivery failure to the gsmSCF (if CAMEL handling was invoked) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
      - if the macro takes the "Abort" exit, the MSC reports the delivery failure to the gsmSCF (if CAMEL handling was invoked), and the process returns to the Null state;
      - if the macro takes the "OK" exit, the MSC reports the successful delivery to the gsmSCF (if CAMEL handling was invoked) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".
        - if there are no more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;
        - if there are more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.
- When the MSC is waiting for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC:
  - if the dialogue with the SMS-GMSC fails, the MSC sends an Abort request to the MS, and the process returns to the Null state;
  - if it receives a Release indication over the A-interface, the MSC aborts the dialogue with the SMS-GMSC, and the process returns to the Null state;
  - if it receives a MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC, it checks the indication.

- if the indication is badly formed, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
- if the indication is OK, the MSC checks whether CAMEL handling is required.
  - if CAMEL handling is required, the MSC calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.
    - if the result is Release_SMS, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error defined by the gsmSCF, and the process returns to the Null state;
    - if the result is Continue, the MSC forwards the short message to the MS over the A interface, as described below.
  - if CAMEL handling is not required, the MSC forwards the short message to the MS over the A interface, as described below;
- the MSC sends an A_RP_MT_DATA request to the MS, and waits for the response from the MS.

- When the MSC is waiting for the response from the MS for delivery of a subsequent short message:
  - if the dialogue with the SMS-GMSC fails, the MSC sends an Abort request to the MS and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the MSC receives a Release indication over the A-interface, the MSC aborts the dialogue with the SMS-GMSC and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the MSC receives an error response from the MS, it maps the error to a MAP user error, reports the delivery failure to the gsmSCF (if CAMEL handling is required) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error, and the process returns to the Null state;
  - if the MSC receives a positive acknowledgement from the MS, it reports the successful delivery to the gsmSCF (if CAMEL handling is required) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".
    - if there are no more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;
    - if there are more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.

~~When initiating the dialogue with the serving MSC, the SMS-G MSC must provide the IMSI of the subscriber to whom the short message is directed.~~

~~The IMSI can be included either in the Destination Reference of the MAP_OPEN indication received from the SMS-G MSC or in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication.~~

~~When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service user in the serving MSC issues a MAP_DELIMITER request primitive in order to trigger the local MAP service provider to confirm the dialogue.~~

~~When receiving the first MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC, the serving MSC sends the MAP_SEND_INFO_FOR_MT_SMS request primitive to the VLR, if the MAP service primitive is accepted and if short message service is supported in the serving MSC.~~

~~The MAP_MT_FORWARD_SHORT_MESSAGE indication primitive is checked by the macro "Check_Indication". If the received MAP service primitive contains errors, the service is aborted and an unexpected data value error or data missing error is returned to the GMSC.~~

~~If the MSC does not support the short message service, the service is aborted in the serving MSC and the error "Facility Not Supported" is returned to the GMSC.~~

~~The subscriber identity information that may be included in the MAP_OPEN indication primitive and in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS" as follows.~~

~~If a Destination Reference has been received in the MAP_OPEN indication, an LMSI must be present in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication. The LMSI shall be included in the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS request sent to the VLR; the associated MAP_OPEN request must contain a Destination Reference that carries an IMSI.~~

~~Otherwise, if the IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication, it is mapped into the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS request that is sent to the VLR. In this case, the IMSI is not accompanied by an LMSI and neither the MAP_OPEN indication received from the SMS-GMSC nor the MAP_OPEN request sent to the VLR shall include a Destination Reference.~~

~~If a Destination Reference has been received in the serving MSC and the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication does not include an LMSI or if no Destination Reference has been received and the sm-RP-DA information field does not cover an IMSI the service is aborted in the serving MSC and the error "Unexpected Data Value" is returned to the SMS-GMSC.~~

~~The following responses to the MAP_SEND_INFO_FOR_MT_SMS request may be received from the VLR:~~

- ~~unidentified subscriber or system failure error. The error code is forwarded to the GMSC;~~
- ~~absent subscriber error. The absent subscriber_SM error is forwarded to the GMSC with the absent subscriber diagnostic indication set to 'IMSI Detached';~~
- ~~unknown subscriber error. The system failure indication is provided to the GMSC;~~
- ~~data missing or unexpected data value error. The system failure indication is provided to the GMSC;~~
- ~~a provider error or an abort indication. The system failure indication is provided to the GMSC;~~
- ~~subscriber busy for MT SMS. The error code is forwarded to the GMSC;~~
- ~~paging procedure invocation (see clause 25.3) reporting the successful outcome of the procedure;~~
- ~~search procedure invocation (see clause 25.3) reporting the successful outcome of the procedure.~~

~~The result of the paging or the search procedure is processed as follows:~~

- ~~if the procedure is completed successfully, the MSC will send the MAP_PROCESS_ACCESS_REQUEST request to the VLR (see clause 25.4);~~
- ~~if the procedure is completed successfully, but the MS has no mobile terminated short message transfer capability, the procedure is terminated and SM delivery failure indication with cause "equipment not SM equipped" is provided to the GMSC;~~
- ~~if the procedure ends unsuccessfully, the termination of the procedure is awaited from the VLR. The absent subscriber_SM error is forwarded to the GMSC with the absent subscriber diagnostic indication set to 'No Paging Response', but the other error causes are reported as a system failure indication.~~

~~If the short message transfer is aborted for any reason, the dialogue with the VLR is aborted. If the procedure with the VLR is aborted by the VLR or by the provider, a system failure indication is provided to the GMSC.~~

~~The unsuccessful outcome of the MAP_PROCESS_ACCESS_REQUEST service is reported by using the system failure error to the GMSC.~~

~~When the service MAP_PROCESS_ACCESS_REQUEST is carried out, the MSC will receive the MAP_SEND_INFO_FOR_MT_SMS confirmation indicating:~~

- ~~the unsuccessful outcome of the procedure. The error indication received from the VLR is forwarded to the GMSC;~~

- the successful outcome of the procedure. The MSC initiates forwarding of the short message to the MS.

The MSC may receive MAP_CONTINUE_CAMEL_SMS_HANDLING. The MSC then opens a CAMEL dialogue with the gsmSCF, as specified in 3GPP TS 23.078. If the CAMEL service bars the MT SM, then the failure is reported to the SMS-GMSC, and the MT SM is not delivered to the MS. Otherwise, the MSC shall send a second MAP_SEND_INFO_FOR_MT_SMS request to the VLR.

If the primitive itself is badly formatted or data is missing, the system failure error is sent to the GMSC.

If forwarding of the short message is initiated, the MSC awaits the result before one of the following responses is sent back to the GMSC:

- an acknowledgement if the short message has been successfully delivered to the mobile subscriber. The successful MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;

- an SM delivery failure error containing a parameter indicating either of the following: there is a MS protocol error or the MS memory capacity is exceeded; detailed diagnostic information (see clause 7.6.1.4) may also be carried. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;

- a system failure error if the delivery procedure is aborted. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078.

If the More Messages To Send flag was FALSE or the service MAP_MT_FORWARD_SHORT_MESSAGE ends unsuccessfully, the transaction to the SMS-GMSC is terminated. If the More Messages To Send flag was TRUE, then the servicing MSC waits for the next short message from the Service Centre.

When receiving the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC the serving MSC will act as follows:

- if the received primitive contains errors, then the unexpected data value error or data missing error is provided to the SMS-GMSC;

- The MSC opens a CAMEL dialogue as specified in 3GPP TS 23.078 for each SM. If the CAMEL service bars the MT SM, then the failure is reported to the GMSC, and the MT SM is not delivered to the MS.

- if the More Messages To Send flag is FALSE, then the serving MSC will start the short message transfer procedure to the mobile subscriber. The successful or unsuccessful outcome of this procedure is reported to the gsmSCF as specified in 3GPP TS 23.078 and to the SMS-GMSC and the transaction is terminated.

- if the More Messages To Send flag is TRUE, then the serving MSC will start the short message transfer to the mobile subscriber. If the outcome of this procedure is unsuccessful, then the SM delivery failure is reported to the gsmSCF and the the reason is reported to the SMS-GMSC and the procedure is terminated. If the procedure is successful, then the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078, and it is acknowledged to the SMS-GMSC and more short messages can be received.

The tracing procedure may be activated. It is described in detail in clause 25.

The mobile terminated short message transfer proces<u>s</u>~~sdure~~ in the serving MSC is shown in figure~~s 23.3/3~~<u>23.3/6.</u> ~~and~~

<u>The macro MT_SM_Transfer_MSC may be invoked either in a stand-alone serving MSC or in a serving MSC which is integrated with the SMS-GMSC. It is used to transfer the first MT short message of a possible sequence of messages.</u>

<u>If the MSC does not support MT SMS, it sets the User Error to "Facility not supported" and the macro takes the "Error" exit.</u>

<u>If the MSC supports MT SMS, it invokes the macro Check_Subscr_Identity_for_SMS. If the macro Check_Subscr_Identity_for_SMS takes the "Error" exit, the macro MT_SM_Transfer_MSC takes the "Error" exit.</u>

<u>If the macro Check_Subscr_Identity_for_SMS takes the the "OK" exit, the MSC sends a dialogue opening request, followed by a MAP_SEND_INFO_FOR_MT_SMS request, to the VLR and waits for a response.</u>

<u>If the dialogue opening fails, the macro takes the "Error" exit.</u>

<u>If the dialogue opening succeeds, the MSC sets the variable CAMEL Handling to False and waits for the response from the VLR.</u>

When the MSC is waiting for the response from the VLR:

- if it receives a MAP_CONTINUE_CAMEL_SMS_HANDLING indication from the VLR, it sets the variable CAMEL Handling to True, calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.
  - if the result is Release_SMS, the MSC aborts the dialogue with the VLR, and the macro takes the "Release SMS" exit;
  - if the result is Continue, the MSC sends a second MAP_SEND_INFO_FOR_MT_SMS request, with the "Suppress MT-SMS-CSI parameter set, to the VLR, and waits for the response from the VLR.
- if it receives a MAP_SEND_INFO_FOR_MT_SMS confirmation, it sets the User Error parameter according to the User Error parameter received in the MAP_SEND_INFO_FOR_MT_SMS confirmation, and the macro takes the "Error" exit;
- if it receives a MAP_PAGE indication, it invokes the Page_MSC macro described in subclause 25.3.
  - if the Page_MSC macro takes the "Null" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;
  - if the Page_MSC macro takes the "Error" exit, the MSC waits for a further response from the VLR;
  - if the Page_MSC macro takes the "OK" exit, the MSC checks whether the MS supports SMS, as described below.
- if it receives a MAP_SEARCH_FOR_MS indication, it invokes the Search_For_MS_MSC macro described in subclause 25.3.
  - if the Search_For_MS_MSC macro takes the "Null" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;
  - if the Search_For_MS_MSC macro takes the "Error" exit, the MSC waits for a further response from the VLR;
  - if the Search_For_MS_MSC macro takes the "OK" exit, the MSC checks whether the MS supports SMS, as described below.
- if the MS does not support SMS, the MSC sets the User Error to "SM Delivery Failure" with delivery failure cause "Equipment not SM equipped", aborts the dialogue with the VLR and aborts the connection to the MS, and the macro takes the "Error" exit;
- if the MS supports SMS, the MSC invokes the macro Process_Access_Request_MSC described in subsclause 25.4.
  - if the Process_Access_Request_MSC macro takes the "Error" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;
  - if the Process_Access_Request_MSC macro takes the "OK" exit, the MSC waits for a further response from the VLR.

When the MSC is waiting for a further response from the VLR:

- if it receives a MAP_TRACE_SUBSCRIBER_ACTIVITY indication from the VLR, it performs tracing activity as described in subclause 25.9, and waits for a further response from the VLR;
- if it receives a MAP_SEND_INFO_FOR_MT_SMS confirmation, it checks the confirmation.
  - if the confirmation contains a User Error, the MSC sets the User Error according to the User Error received in the confirmation, and the macro takes the "Error" exit;
  - if the confirmation contains a Provider Error or a Data Error, the MSC sets the User Error to "System failure", and the macro takes the "Error" exit;
  - if the confirmation indicates success, the MSC forwards the short message to the MS, and waits for a response from the MS.

- if the MS returns an error, the MSC sets the User Error according to the response from the MS, and the macro takes the "Error" exit;

- if the MS returns a positive~~a~~ acknowledgement, the macro takes the "OK" exit.

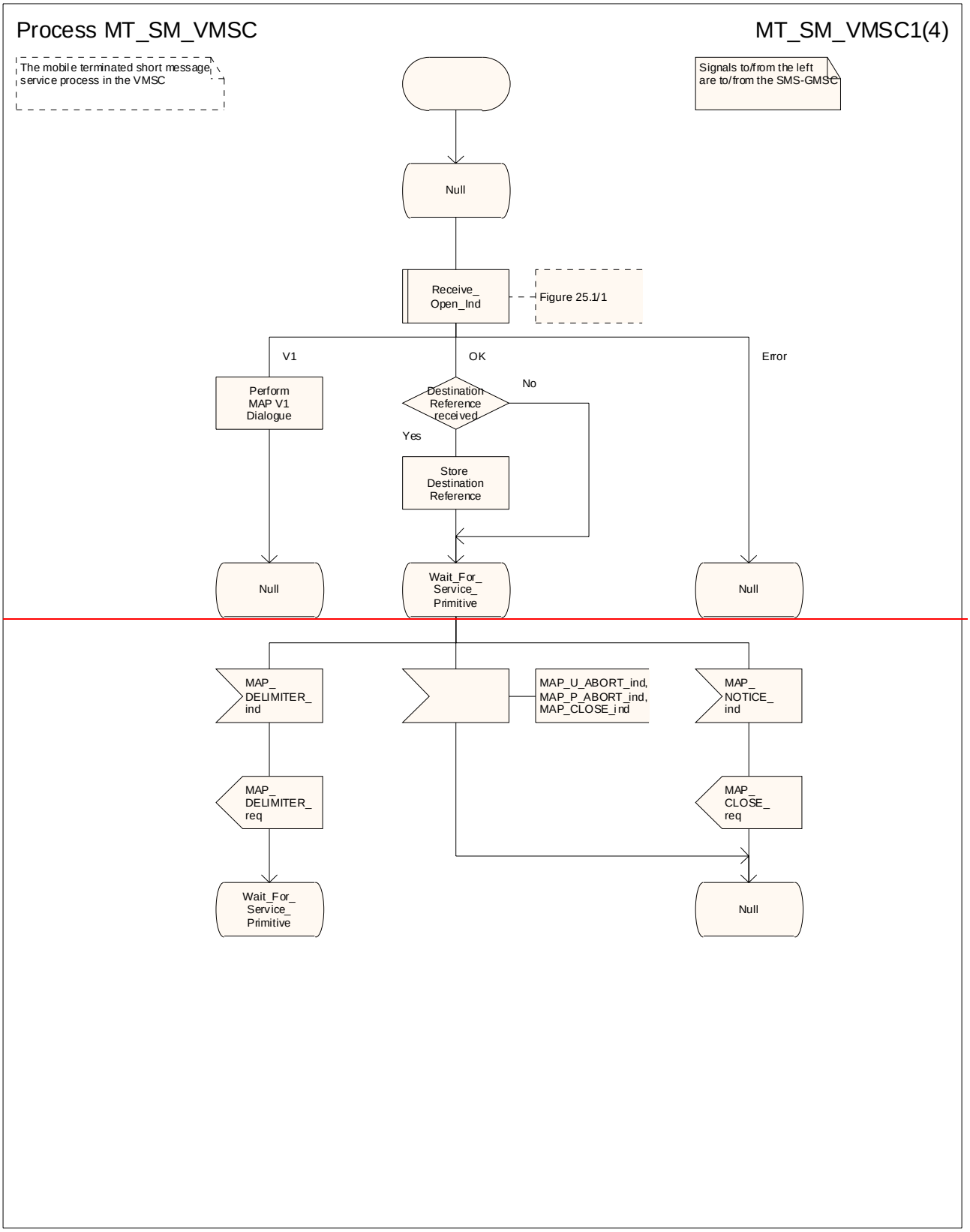
When the MSC is waiting for a response from the VLR for the MAP_SEND_INFO_FOR_MT_SMS request, or a response from the VLR for the MAP_PROCESS_ACCESS_REQUEST request, or the response from the MS for the first short message:

- if the MSC receives a Release on the A-interface, it aborts the dialogue with the VLR (if the dialogue is still open) and sets the User Error to "System failure", and the macro takes the "Error" exit;

- if the dialogue with the VLR fails, the MSC aborts the connection to the MS and sets the User Error to "System failure", and the macro takes the "Error" exit;

- if the dislogue with the SMS-GMSC fails, the the MSC aborts the dialogue with the VLR (if the dialogue is still open) and aborts the connection to the MS, and the macro takes the "Abort" exit.

~~23.3/4~~The macro MT_SM_Transfer_MSC is shown in figure 23.3/7. The macro Check_Subscr_Identity_For_MT_SMS is shown in figure 23.3/8.~~The page and search procedures are shown in figures 25.3/1 and 25.3/2.~~


Process MT_SM_VMSC
MT_SM_VMSC1(4)
The mobile terminated short message service process in the VMSC
Signals to/from the left are to/from the SMS-GMSC
Null
Receive_ Open_Ind
Figure 25.1/1
V1
OK
Error
Perform MAP V1 Dialogue
Destination Reference received
No
Yes
Store Destination Reference
Null
Wait_For_ Service_ Primitive
Null
MAP_ DELIMITER_ ind
MAP_U_ABORT_ind, MAP_P_ABORT_ind, MAP_CLOSE_ind
MAP_ NOTICE_ ind
MAP_ DELIMITER_ req
MAP_ CLOSE_ req
Wait_For_ Service_ Primitive
Null

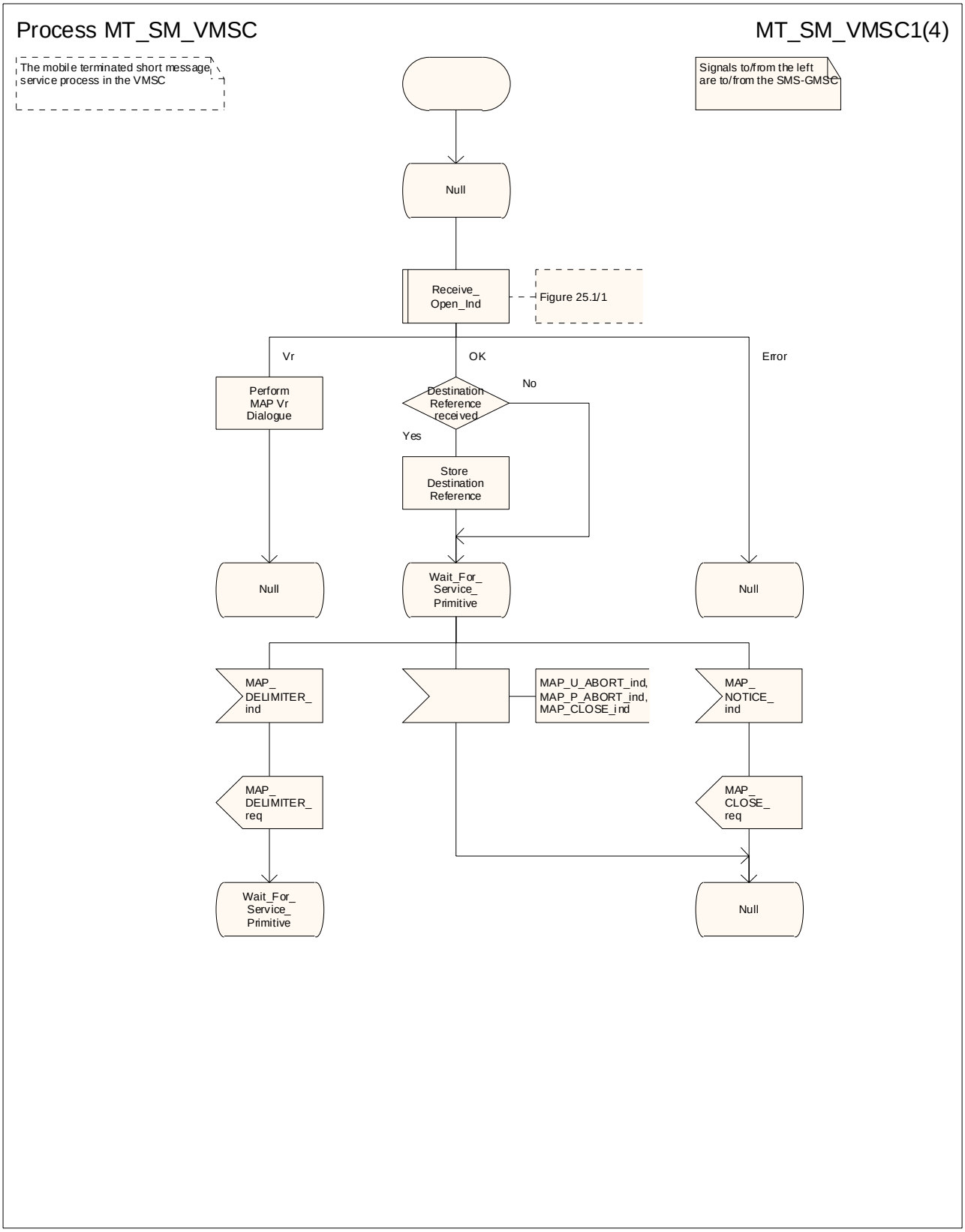
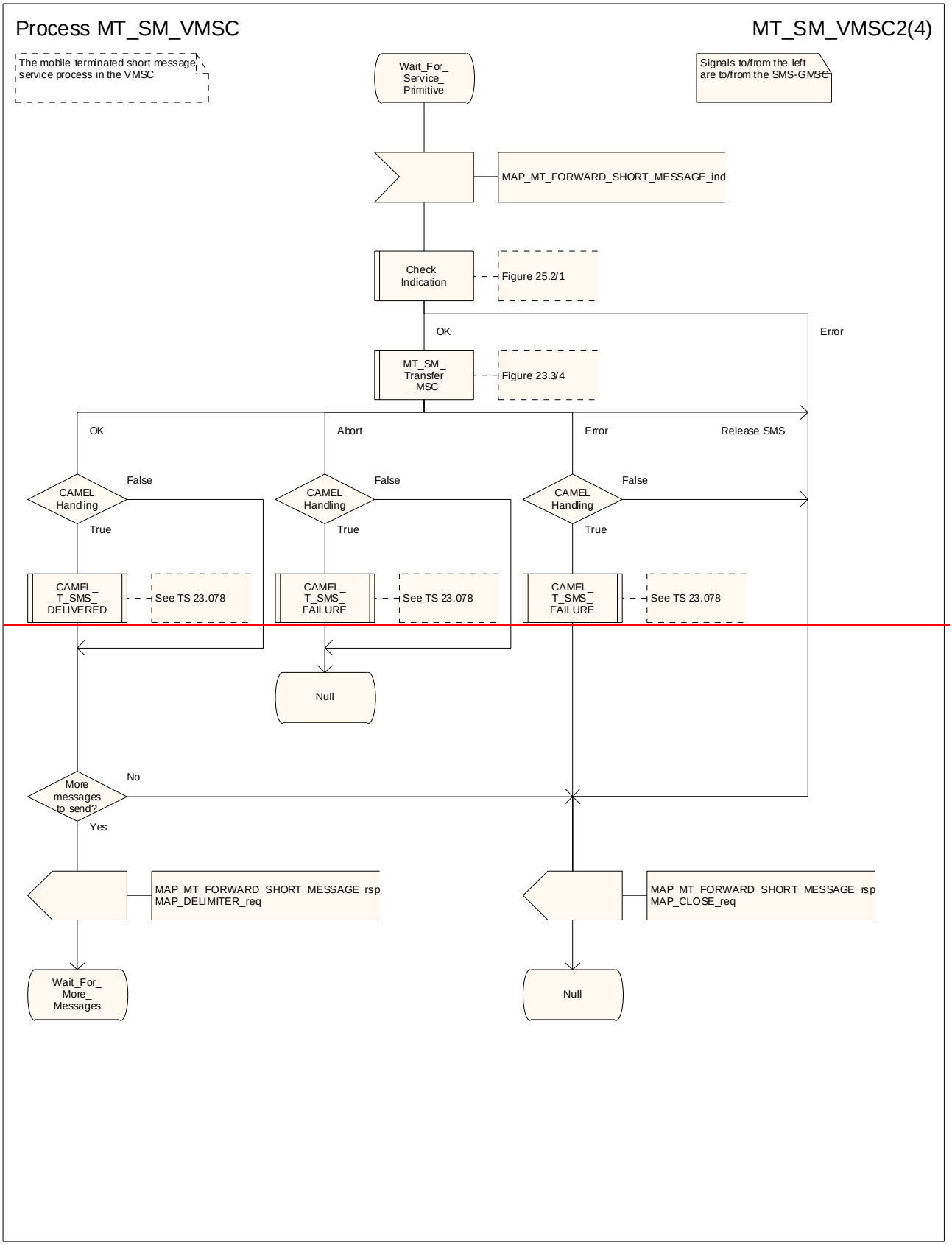
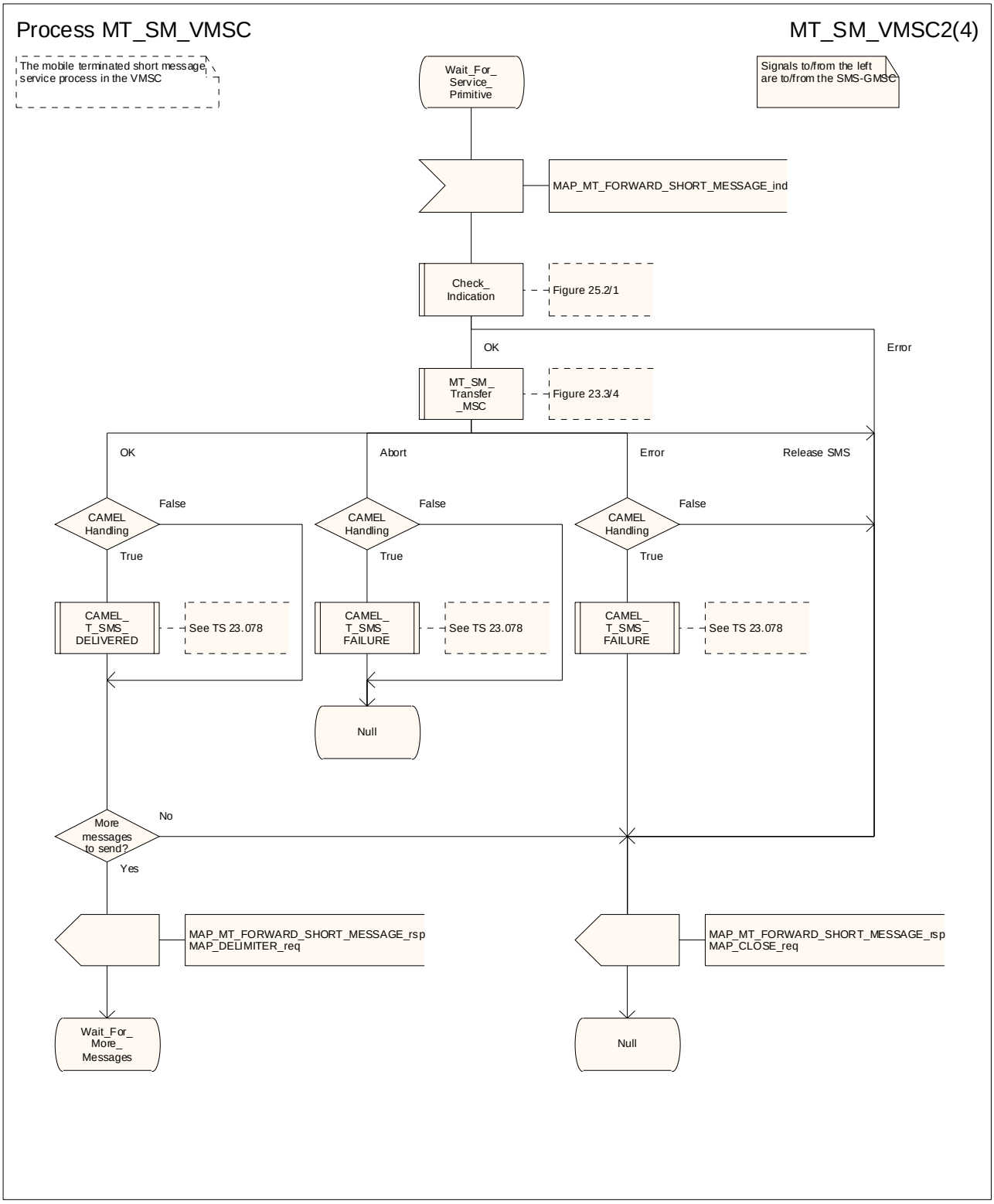


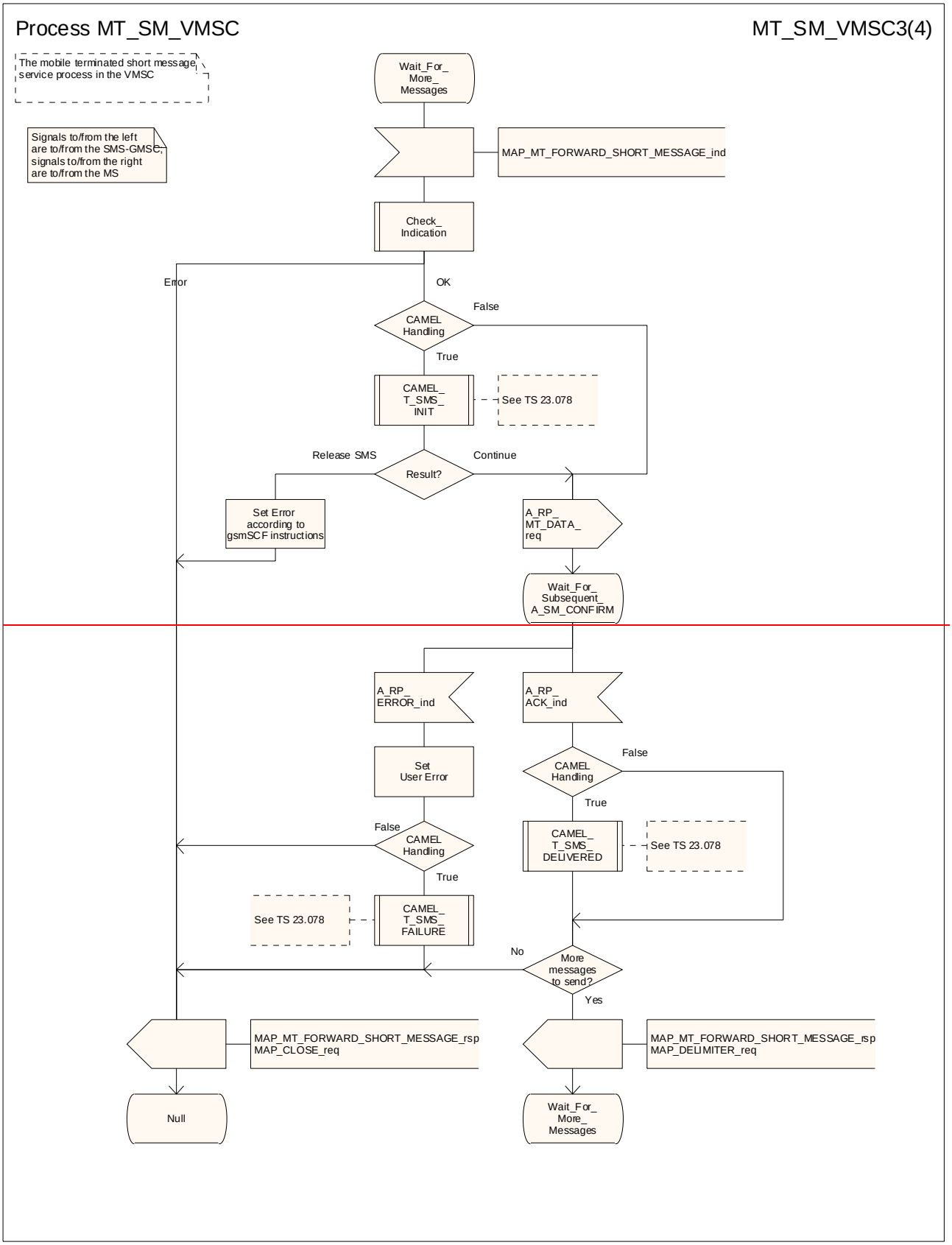
Figure ~~23.3/3~~23.3/6 (sheet 1 of 4): Procedure MT_SM_VMSC


Process MT_SM_VMSC
MT_SM_VMSC2(4)
The mobile terminated short message service process in the VMSC
Wait_For_ Service_ Primitive
Signals to/from the left are to/from the SMS-GMSC
MAP_MT_FORWARD_SHORT_MESSAGE_ind
Check_ Indication
Figure 25.2/1
OK
Error
MT_SM_ Transfer _MSC
Figure 23.3/4
OK
Abort
Error
Release SMS
CAMEL Handling
False
True
CAMEL_ T_SMS_ DELIVERED
See TS 23.078
CAMEL_ T_SMS_ FAILURE
Null
More messages to send?
No
Yes
MAP_MT_FORWARD_SHORT_MESSAGE_rsp
MAP_DELIMITER_req
MAP_CLOSE_req
Wait_For_ More_ Messages



CR editor's note: the only change to this sheet is the size of the frame!

Figure ~~23.3/3~~23.3/6 (sheet 2 of 4): Procedure MT_SM_VMSC


Process MT_SM_VMSC
MT_SM_VMSC3(4)
The mobile terminated short message service process in the VMSC
Signals to/from the left are to/from the SMS-GMSC, signals to/from the right are to/from the MS
Wait_For_ More_ Messages
MAP_MT_FORWARD_SHORT_MESSAGE_ind
Check_ Indication
Error
OK
CAMEL Handling
False
True
CAMEL_ T_SMS_ INIT
See TS 23.078
Release SMS
Result?
Continue
Set Error according to gsmSCF instructions
A_RP_ MT_DATA_ req
Wait_For_ Subsequent_ A_SM_CONFIRM
A_RP_ ERROR_ind
A_RP_ ACK_ind
Set User Error
CAMEL Handling
False
True
CAMEL_ T_SMS_ DELIVERED
See TS 23.078
False
CAMEL Handling
True
See TS 23.078
CAMEL_ T_SMS_ FAILURE
No
More messages to send?
Yes
MAP_MT_FORWARD_SHORT_MESSAGE_rsp MAP_CLOSE_req
MAP_MT_FORWARD_SHORT_MESSAGE_rsp MAP_DELIMITER_req
Null
Wait_For_ More_ Messages

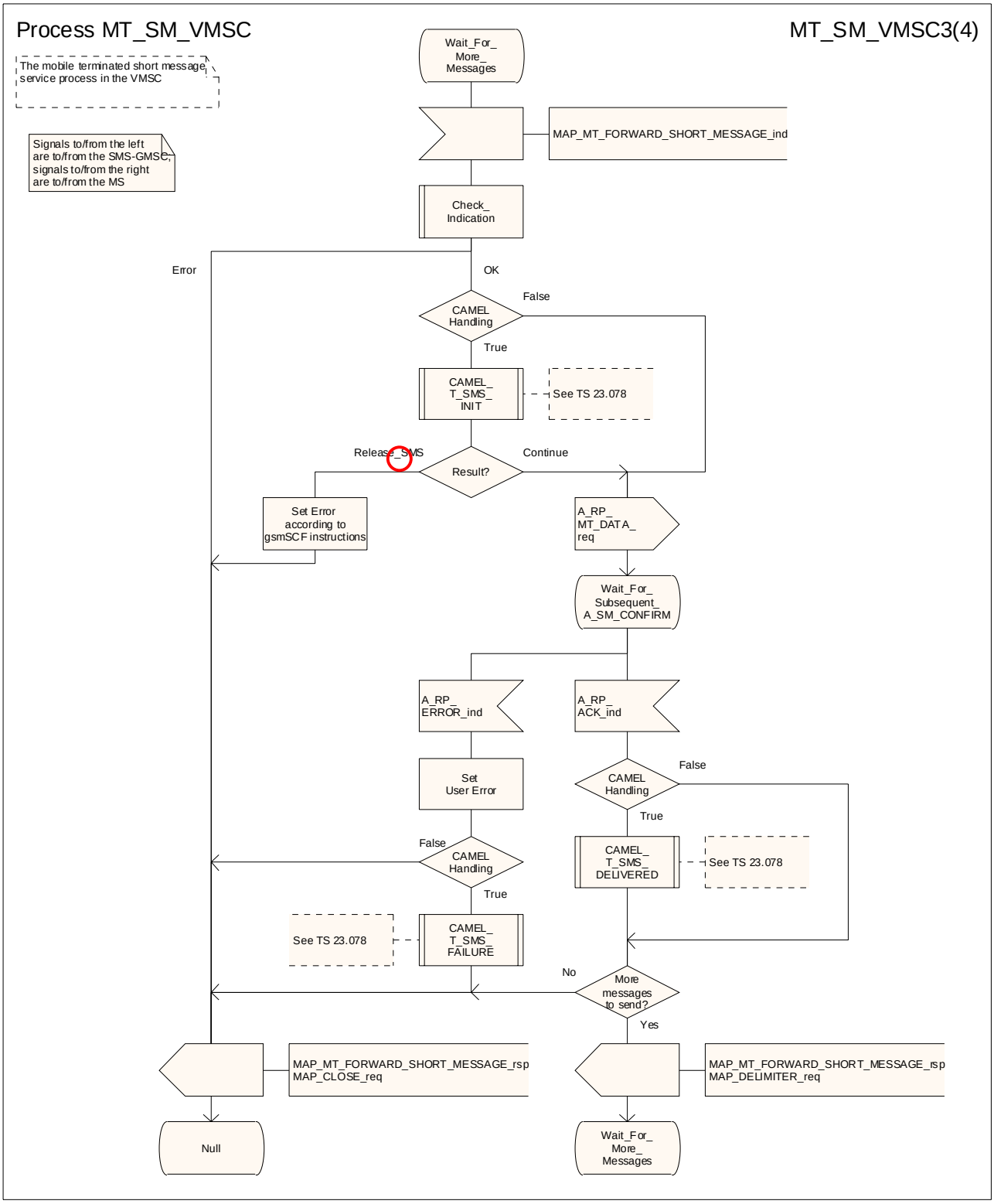


Figure ~~23.3/3~~23.3/6 (sheet 3 of 4): Procedure MT_SM_VMSC

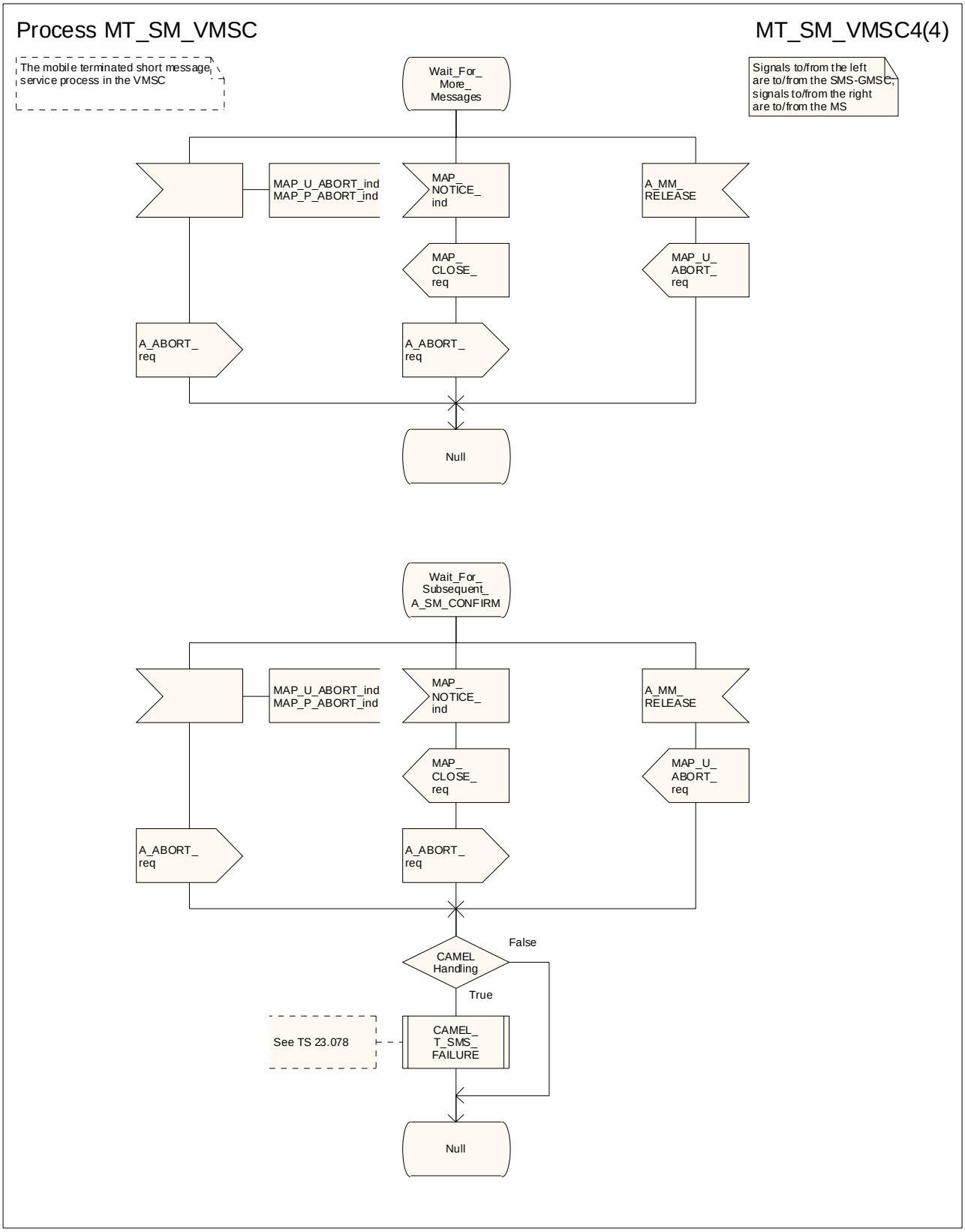
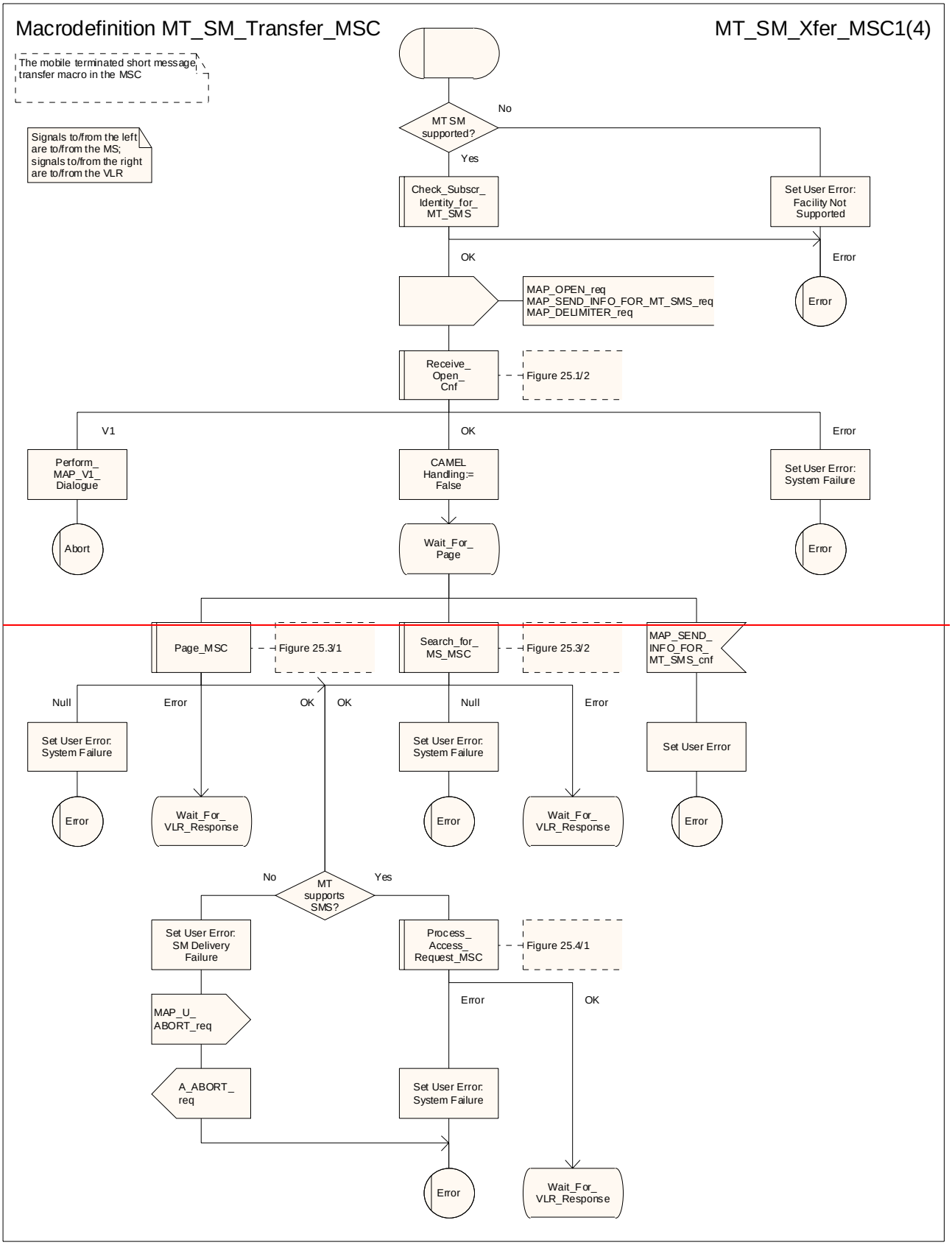


Figure ~~23.3/3~~23.3/6 (sheet 4 of 4): Procedure MT_SM_VMSC


Macrodefinition MT_SM_Transfer_MSC
MT_SM_Xfer_MSC1(4)
The mobile terminated short message transfer macro in the MSC
Signals to/from the left are to/from the MS; signals to/from the right are to/from the VLR
MT SM supported?
No
Yes
Check_Subscr_ Identity_for_ MT_SMS
Set User Error: Facility Not Supported
OK
Error
MAP_OPEN_req
MAP_SEND_INFO_FOR_MT_SMS_req
MAP_DELIMITER_req
Error
Receive_ Open_ Cnf
Figure 25.1/2
V1
OK
Error
Perform_ MAP_V1_ Dialogue
CAMEL Handling:= False
Set User Error: System Failure
Abort
Wait_For_ Page
Error
Page_MSC
Figure 25.3/1
Search_for_ MS_MSC
Figure 25.3/2
MAP_SEND_ INFO_FOR_ MT_SMS_cnf
Null
Error
OK
OK
Null
Error
Set User Error: System Failure
Set User Error: System Failure
Set User Error
Error
Wait_For_ VLR_Response
Error
Wait_For_ VLR_Response
Error
No
MT supports SMS?
Yes
Set User Error: SM Delivery Failure
Process_ Access_ Request_MSC
Figure 25.4/1
Error
OK
MAP_U_ ABORT_req
A_ABORT_ req
Set User Error: System Failure
Error
Wait_For_ VLR_Response

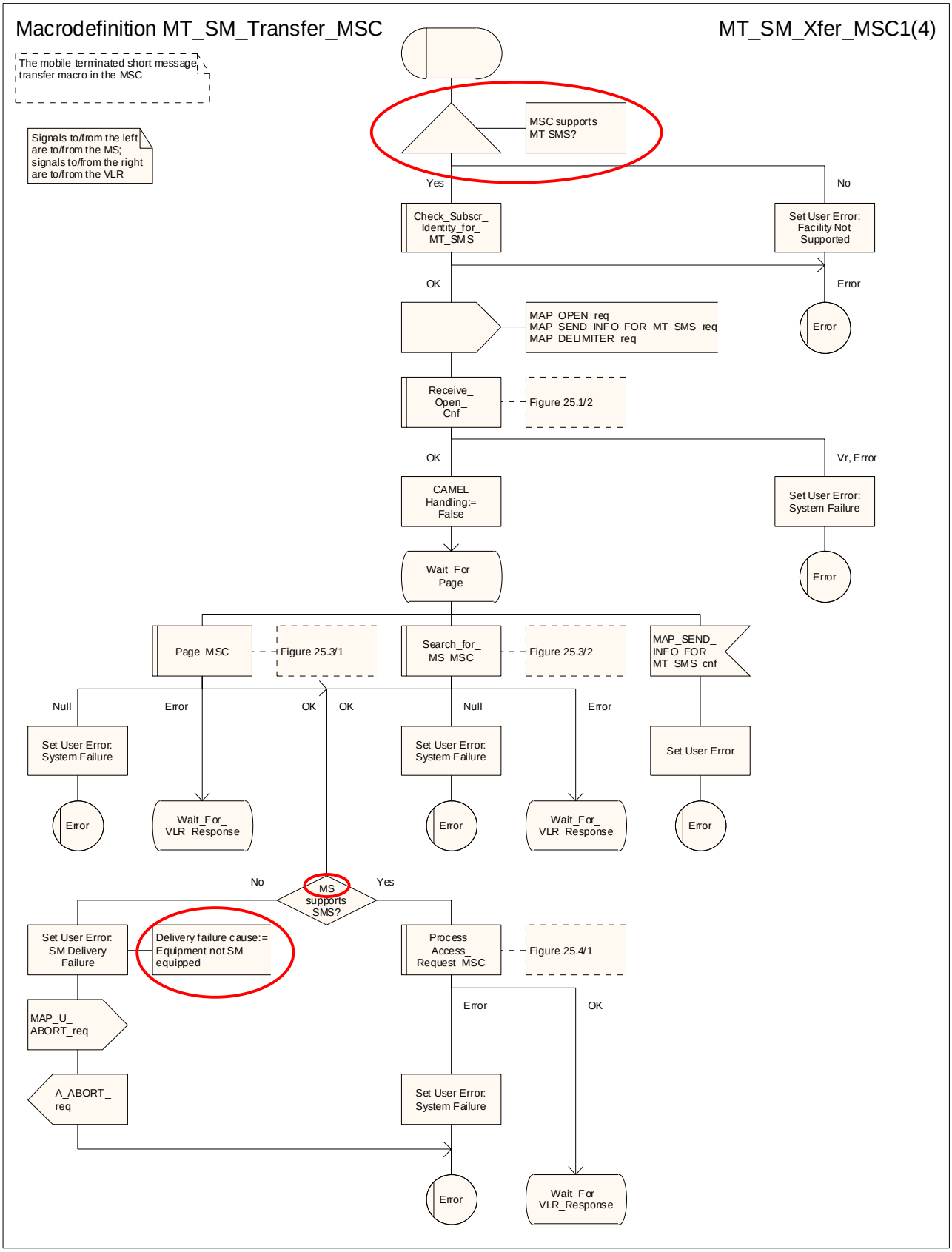
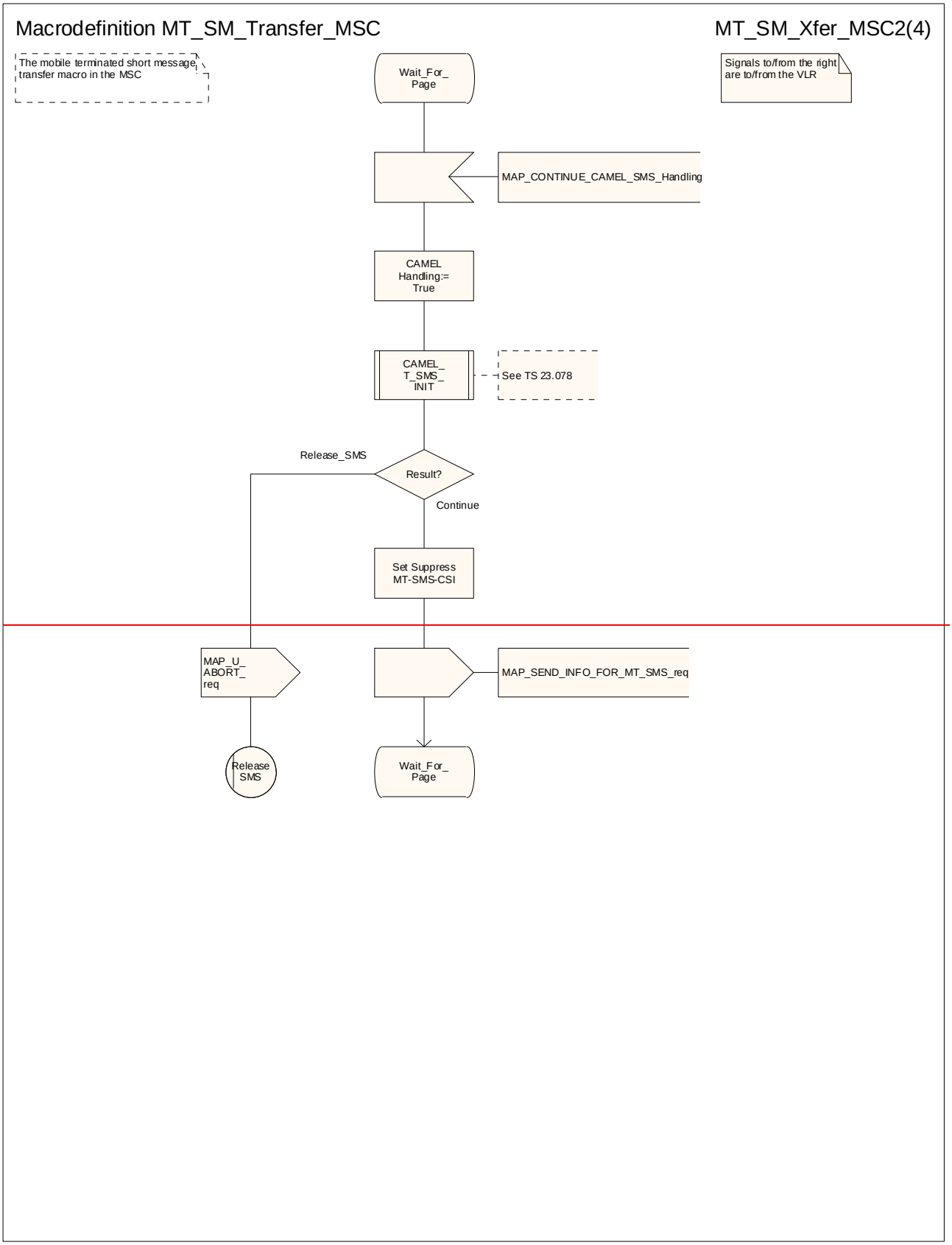


Figure ~~23.3/4~~23.3/7 (sheet 1 of 4): Macro MT_SM_Transfer_MSC


Macrodefinition MT_SM_Transfer_MSC
MT_SM_Xfer_MSC2(4)
The mobile terminated short message transfer macro in the MSC
Signals to/from the right are to/from the VLR
Wait_For_ Page
MAP_CONTINUE_CAMEL_SMS_Handling
CAMEL Handling:= True
CAMEL_ T_SMS_ INIT
See TS 23.078
Release_SMS
Result?
Continue
Set Suppress MT-SMS-CSI
MAP_U_ ABORT_ req
MAP_SEND_INFO_FOR_MT_SMS_req
Release SMS
Wait_For_ Page

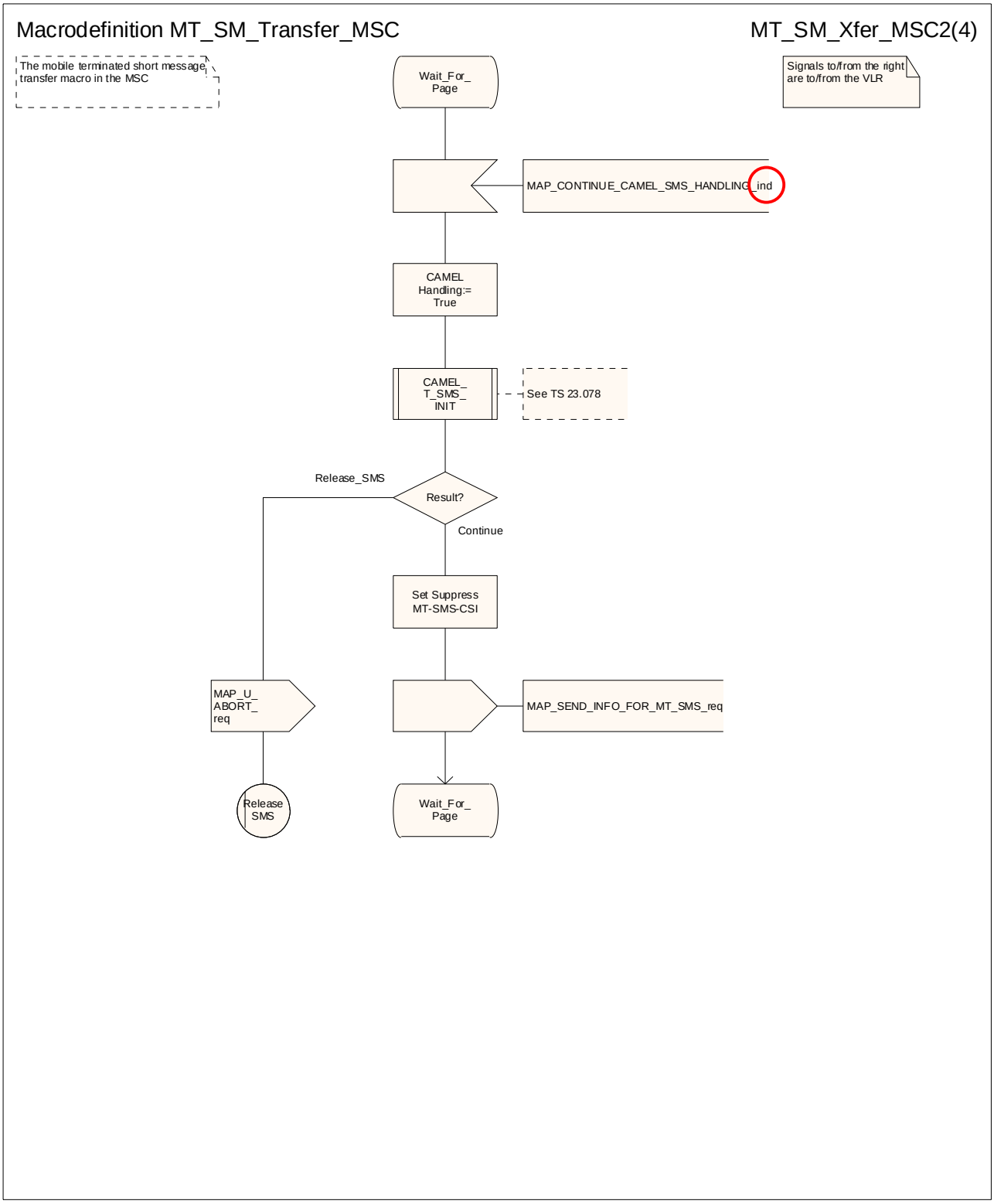


Figure ~~23.3/4~~23.3/7 (sheet 2 of 4): Macro MT_SM_Transfer_MSC

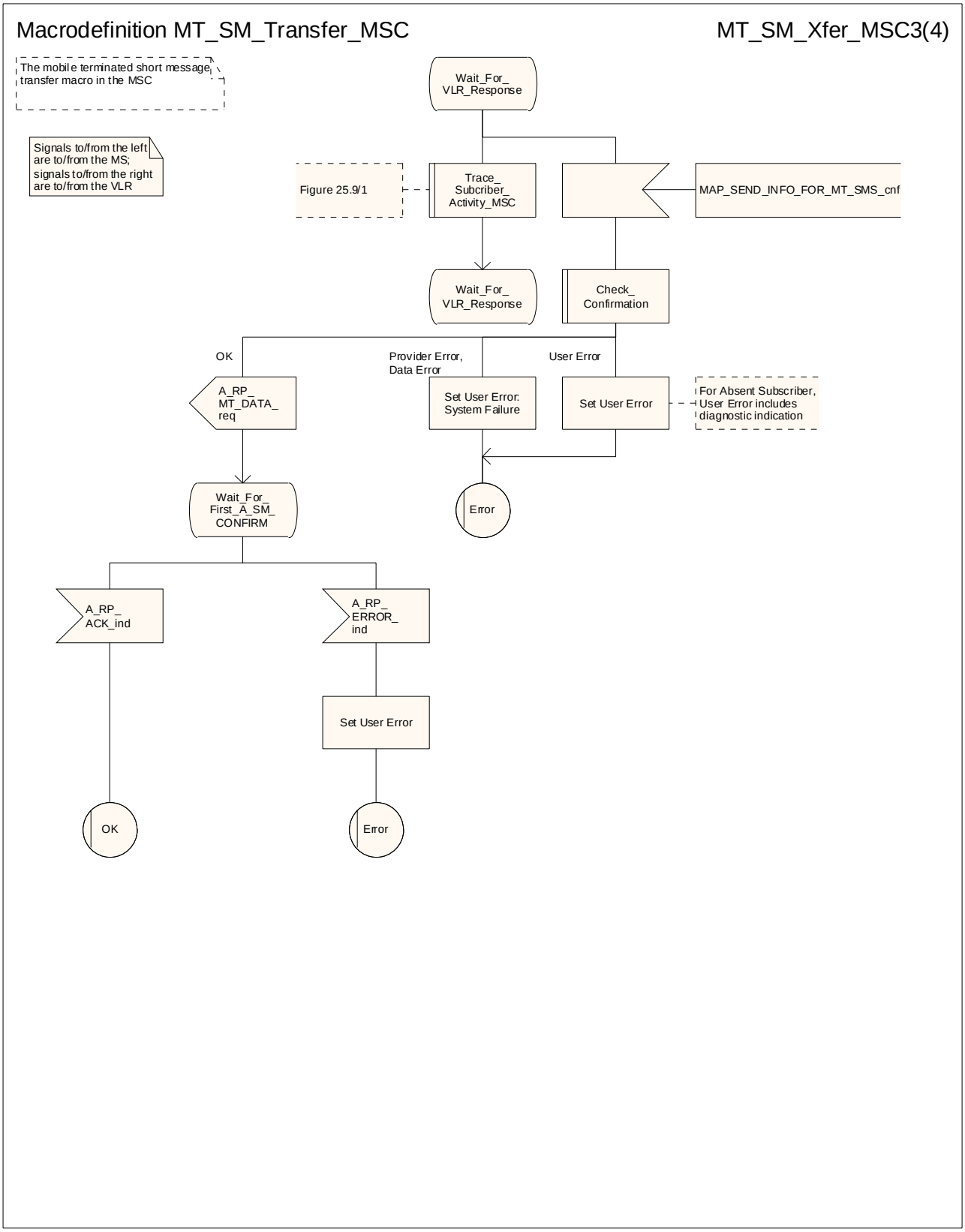
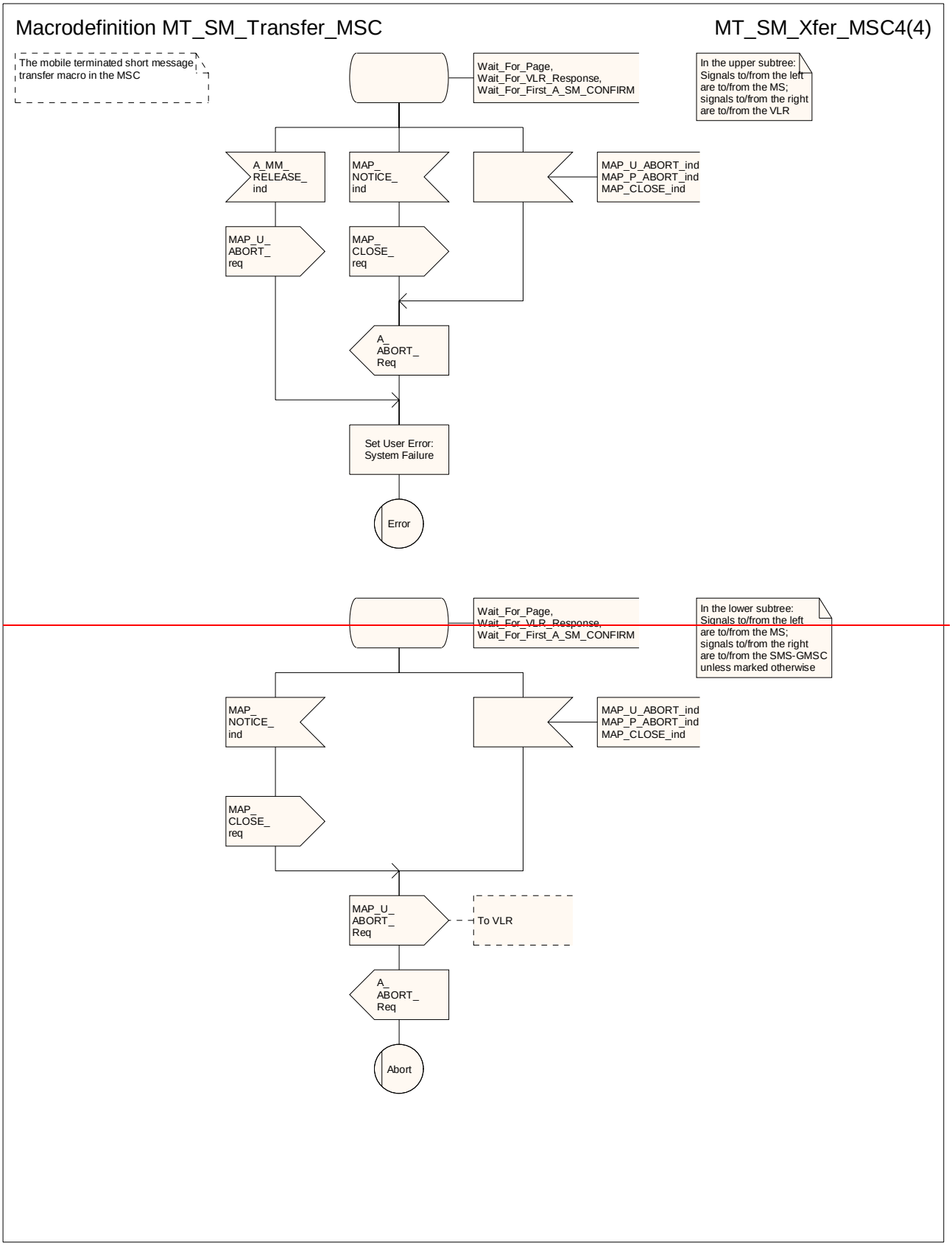
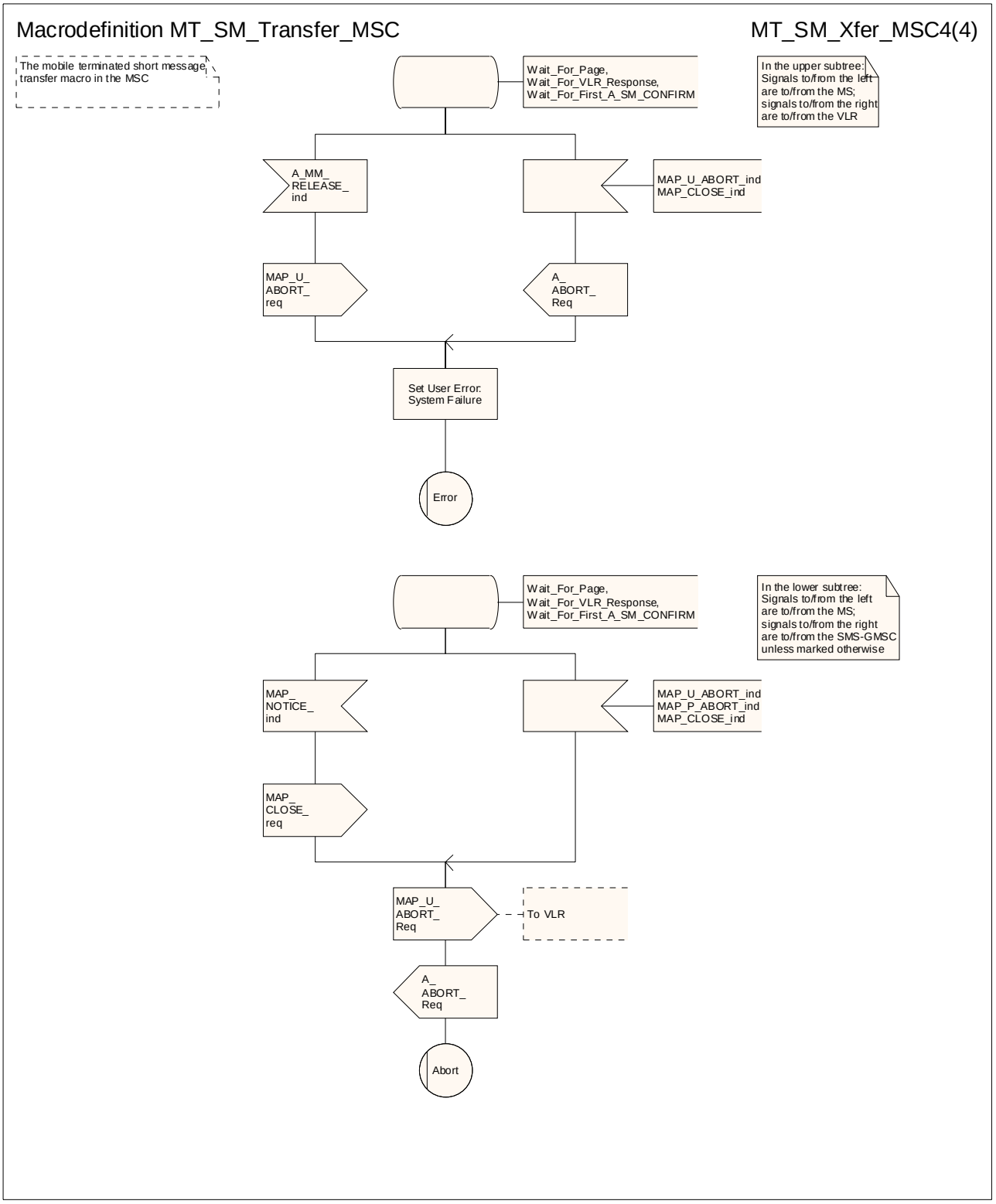


Figure ~~23.3/4~~23.3/7 (sheet 3 of 4): Macro MT_SM_Transfer_MSC


Macrodefinition MT_SM_Transfer_MSC
MT_SM_Xfer_MSC4(4)
The mobile terminated short message transfer macro in the MSC
Wait_For_Page,
Wait_For_VLR_Response,
Wait_For_First_A_SM_CONFIRM
In the upper subtree:
Signals to/from the left are to/from the MS;
signals to/from the right are to/from the VLR
A_MM_ RELEASE_ ind
MAP_ NOTICE_ ind
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
MAP_U_ ABORT_ req
MAP_ CLOSE_ req
A_ ABORT_ Req
Set User Error: System Failure
Error
Wait_For_Page,
Wait_For_VLR_Response,
Wait_For_First_A_SM_CONFIRM
In the lower subtree:
Signals to/from the left are to/from the MS;
signals to/from the right are to/from the SMS-GMSC unless marked otherwise
MAP_ NOTICE_ ind
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
MAP_ CLOSE_ req
MAP_U_ ABORT_ Req
To VLR
A_ ABORT_ Req
Abort

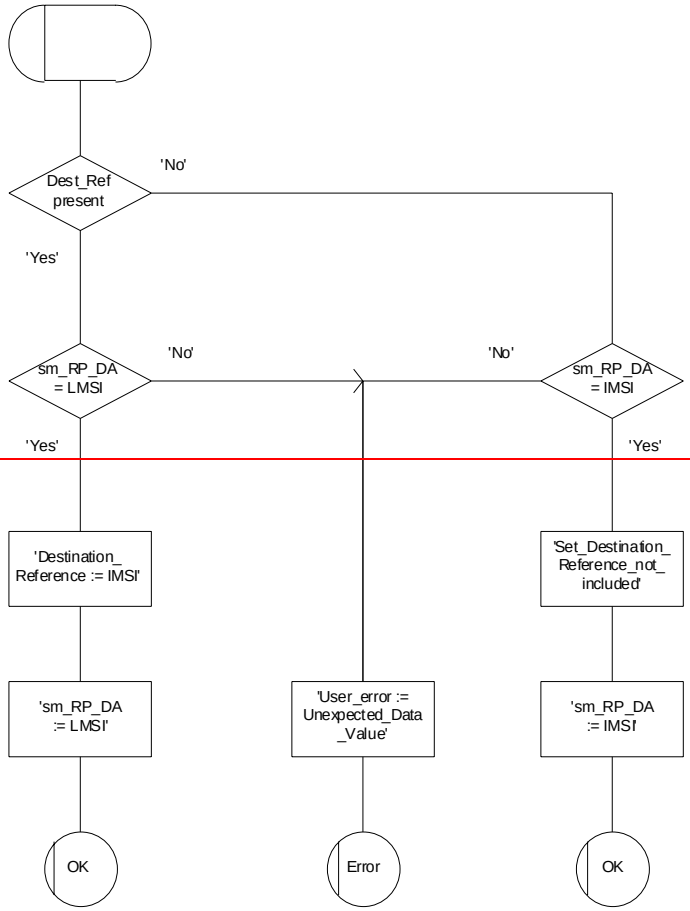


CR editor's note: the only change to this sheet is the size of the frame!

Figure ~~23.3/4~~23.3/7 (sheet 4 of 4): Macro MT_SM_Transfer_MSC

Macrodefinition Check_Subscr_Identity_For_MT_SMS 23.3_8(1)

Figure 23.3/8: Check of the subscriber identity for a mobile terminated short message in the servicing MSC and in the VLR



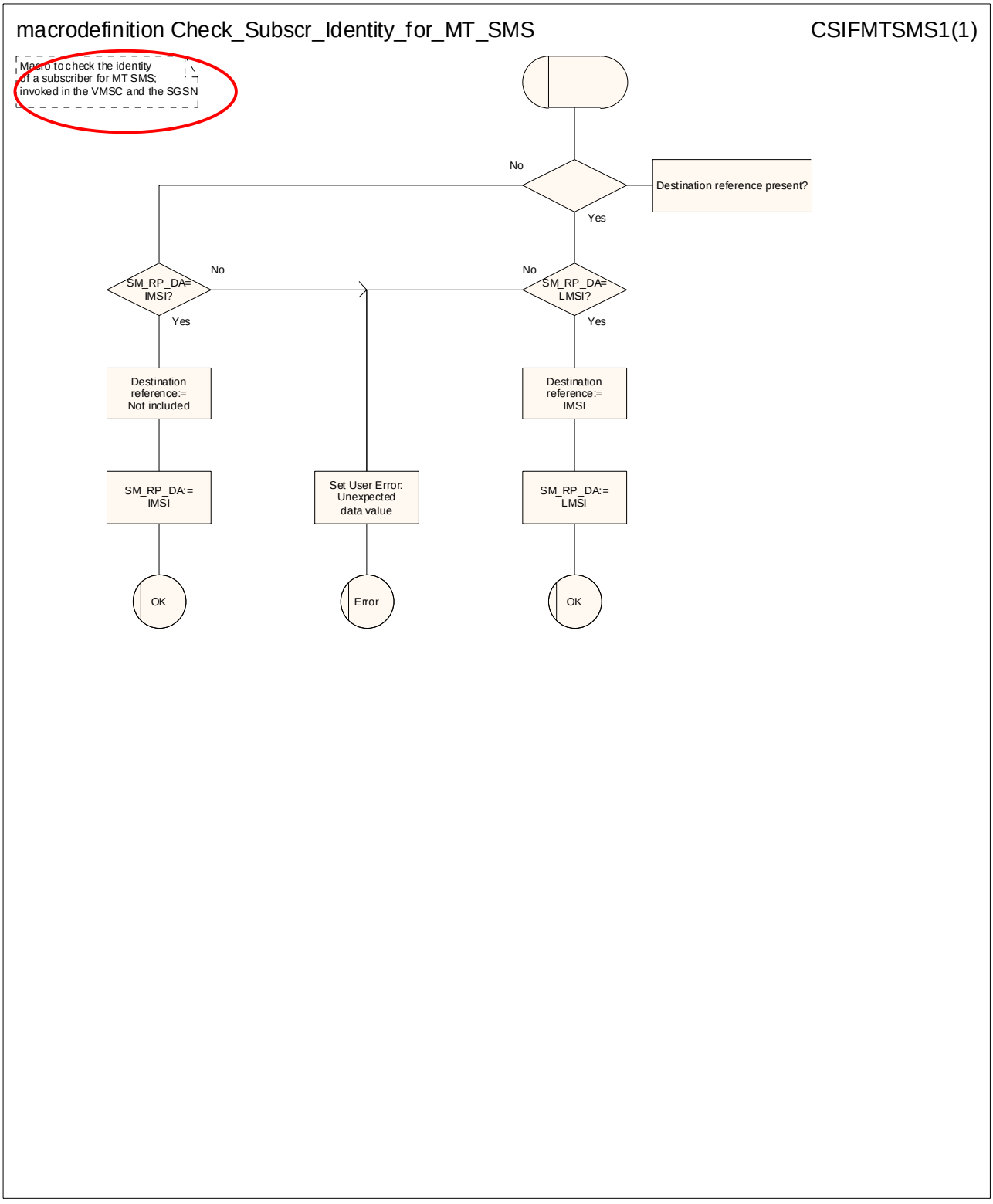


Figure 23.3/8: Macro Check_Subscr_Identity_For_MT_SMS

23.3.42 Procedures in the VLR

Any CAMEL-specific handling defined in this subclause is omitted if the VLR does not support CAMEL control of MTO SMS.

The process is triggered by a dialogue opening request from the MSC.

If the macro Receive_Open_Ind takes the "Vr" exit or the "Error" exit, the process returns to the Null state.

If the macro Receive_Open_Ind takes the "OK" exit, the VLR waits for a service primitive.

When the VLR receives a MAP_SEND_INFO_FOR_MT_SMS indication, it checks the indication.

- if the indication is badly formed, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the appropriate User Error, and the process returns to the Null state;
- if the indication is OK, the VLR checks the subscription information.

If the VLR has no record for the subscriber, or the subscriber record is marked as not confirmed by the HLR, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Unidentified subscriber", and the process returns to the Null state.

If the subscriber is marked as IMSI detached, or service is not allowed in the location area where the subscriber is currently registered, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Absent subscriber" with the diagnostic "IMSI detached", and the process returns to the Null state.

If the subscription checks are successful, the VLR calls the procedure CAMEL_MT_SMS_VLR, which is specified in 3GPP TS 23.078 [98], and checks the result.

- if the result is Fail, the process returns to the Null state;
- if the result is Pass, the VLR checks whether the location of the MS is known, and whether the location is confirmed by radio contact.
    - if the location is known and confirmed by radio contact, the VLR sends a MAP_PAGE request to the MSC;
    - if the location is not known, or not confirmed by radio contact, the VLR sends a MAP_SEARCH_FOR_MS request to the MSC.
- the VLR waits for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC.

When the VLR is waiting for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC:

- if the dialogue is aborted by the MSC, the process returns to the NULL state;
- if it receives a MAP_PAGE confirmation, it checks the User Error received in the confirmation, as below;
- if it receives a MAP_SEARCH_FOR_MS confirmation, it checks the confirmation.
    - if the confirmation contained a Provider Error or a Data Error, the process returns to the Null state;
    - if the confirmation contained a User Error, the VLR checks the User Error, as below;
    - if the confirmation indicated a successful result, the VLR updates the LAI and sets the Confirmed by Radio Contact indicator to Confirmed, and waits for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC.
- if it receives a MAP_PROCESS_ACCESS_REQUEST indication, it invokes the macro Process_Access_Request_VLR.
    - if the macro takes the "Error" exit, the process returns to the Null state;
    - if the macro takes the "OK" exit, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the MSISDN of the subscriber, and the process returns to the Null state.

If the VLR receives a MAP_PAGE confirmation or a MAP_SEARCH_FOR_MS confirmation containing a User Error, it checks the user error.

- if the User Error is Absent Subscriber, the VLR sets the MNRF and returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Absent subscriber" with diagnostic "No response to paging", and the process returns to the Null state;

- for any other User Error, the VLR relays the User Error in a MAP_SEND_INFO_FOR_MT_SMS response, and the process returns to the Null state.

~~When receiving the MAP_SEND_INFO_FOR_MT_SMS indication, the VLR will act as follows:~~

- ~~the parameters and data in the primitive are checked by the macro "Check_Indication". A data failure is reported as an unexpected data value error or a data missing error depending on the nature of the failure;~~

- ~~for mobile terminated short message the mobile subscriber is identified either by the IMSI only or by the IMSI accompanied by the LMSI. The subscriber identity information that may be included in the MAP_OPEN indication primitive and in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS". In the first case, the IMSI is included in the sm-RP-DA information field and the Destination Reference must not be present in the MAP_OPEN primitive. In the latter case the IMSI must be obtained from the Destination Reference of the MAP_OPEN indication primitive and an LMSI must be present in the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS indication. If the mobile subscriber is unknown, the unidentified subscriber error is returned;~~

- ~~if the "Confirmed by HLR" indicator is set to "Not Confirmed", the unidentified subscriber error is returned;~~

- ~~if the IMSI Detached Flag is set to detached or the LA Not Allowed Flag is set to not allowed in the VLR, an absent subscriber error with the diagnostic indication set to 'IMSI Detached' is returned and the MS not reachable flag (MNRF) is set;~~

- ~~if the MAP_SEND_INFO_FOR_MT_SMS indication has passed the tests and the subscriber is provisioned with MT-SMS-CSI in the VLR, then the VLR shall send MT-SMS-CSI to the MSC in order to have the MSC initiate a CAMEL dialogue with the CSE.~~

- ~~if the MAP_SEND_INFO_FOR_MT_SMS indication has passed all the tests, the VLR will initiate the paging procedure. If the location area identification is known and the "Confirmed by Radio Contact" indicator is set to "Confirmed", the MAP_PAGE service is used. Otherwise the MAP_SEARCH_FOR_MOBILE_SUBSCRIBER service is started.~~

~~The following responses to the paging procedure may be received from the MSC:~~

- ~~the MAP_SEARCH_FOR_MOBILE_SUBSCRIBER confirmation indicating a successful outcome, if the search procedure is used. After that the VLR awaits the MAP_PROCESS_ACCESS_REQUEST indication from the MSC;~~

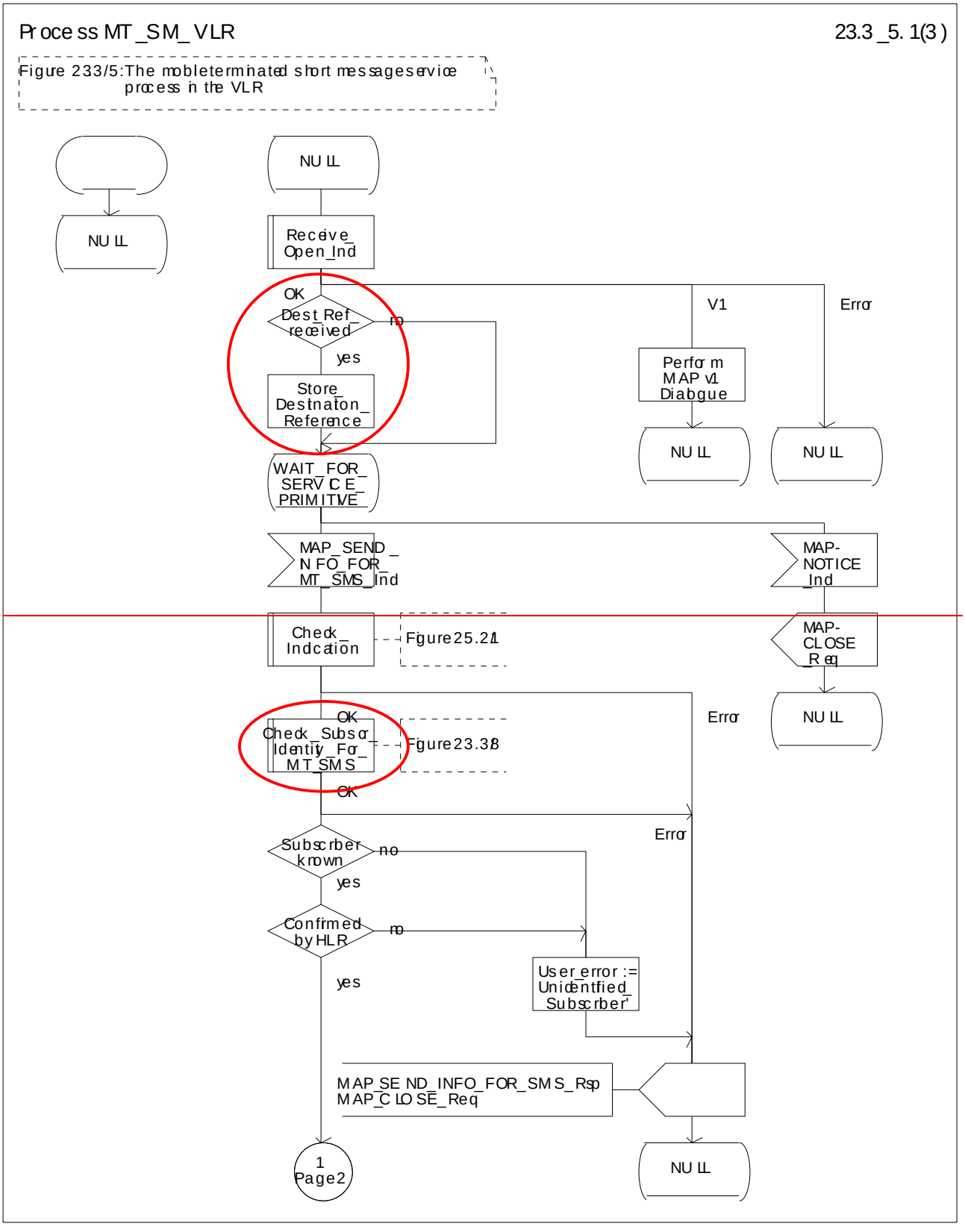
- ~~the MAP_PAGE confirmation or MAP_SEARCH_FOR_MOBILE_SUBSCRIBER confirmation indicating unsuccessful outcome. If an absent subscriber error is received, the MS not reachable flag (MNRF) is set in the VLR. The errors are forwarded to the MSC in the MAP_SEND_INFO_FOR_MT_SMS response, the absent subscriber error is forwarded with the diagnostic indication set to 'No Paging Response for non GPRS'. If the unexpected data value, or unknown location area error is received, the system failure indication is given to the MSC; if subscriber busy for MT SMS is received, this cause is given to the MSC.~~

- ~~the MAP_PROCESS_ACCESS_REQUEST indication telling that the outcome of the service MAP_PAGE is successful.~~

~~If the paging procedure or process access request procedure or any other procedure invoked fails, the appropriate error is reported to the MSC.~~

~~If the process access request procedure is successful, the VLR will send the MAP_SEND_INFO_FOR_MT_SMS response to the MSC and the transaction is terminated in the VLR.~~

The mobile terminated short message transfer proces~~sdure~~ in the VLR is shown in figure ~~23.3/5~~23.3/9.


Process MT_SM_VLR
23.3_5.1(3)
Figure 23.3/5:The mobileterminated short messageservice process in the VLR
NULL
NULL
Receive_Open_Ind
OK
Dest_Ref_received
no
yes
Store_Destnation_Reference
V1
Error
Perform MAP v1 Diabgue
NULL
NULL
WAIT_FOR_SERVICE_PRIMITIVE
MAP_SEND_INFO_FOR_MT_SMS_Ind
MAP-NOTICE_Ind
Check_Indcation
Figure25.21
MAP-CLOSE_Req
Error
NULL
OK
Check_Subscr_Identity_For_MT_SMS
Figure23.38
OK
Error
Subscriber known
no
yes
Confirmed by HLR
no
yes
User_error := Unidentfied_Subscriber
MAP_SEND_INFO_FOR_SMS_Rsp
MAP_CLOSE_Req
1
Page2
NULL

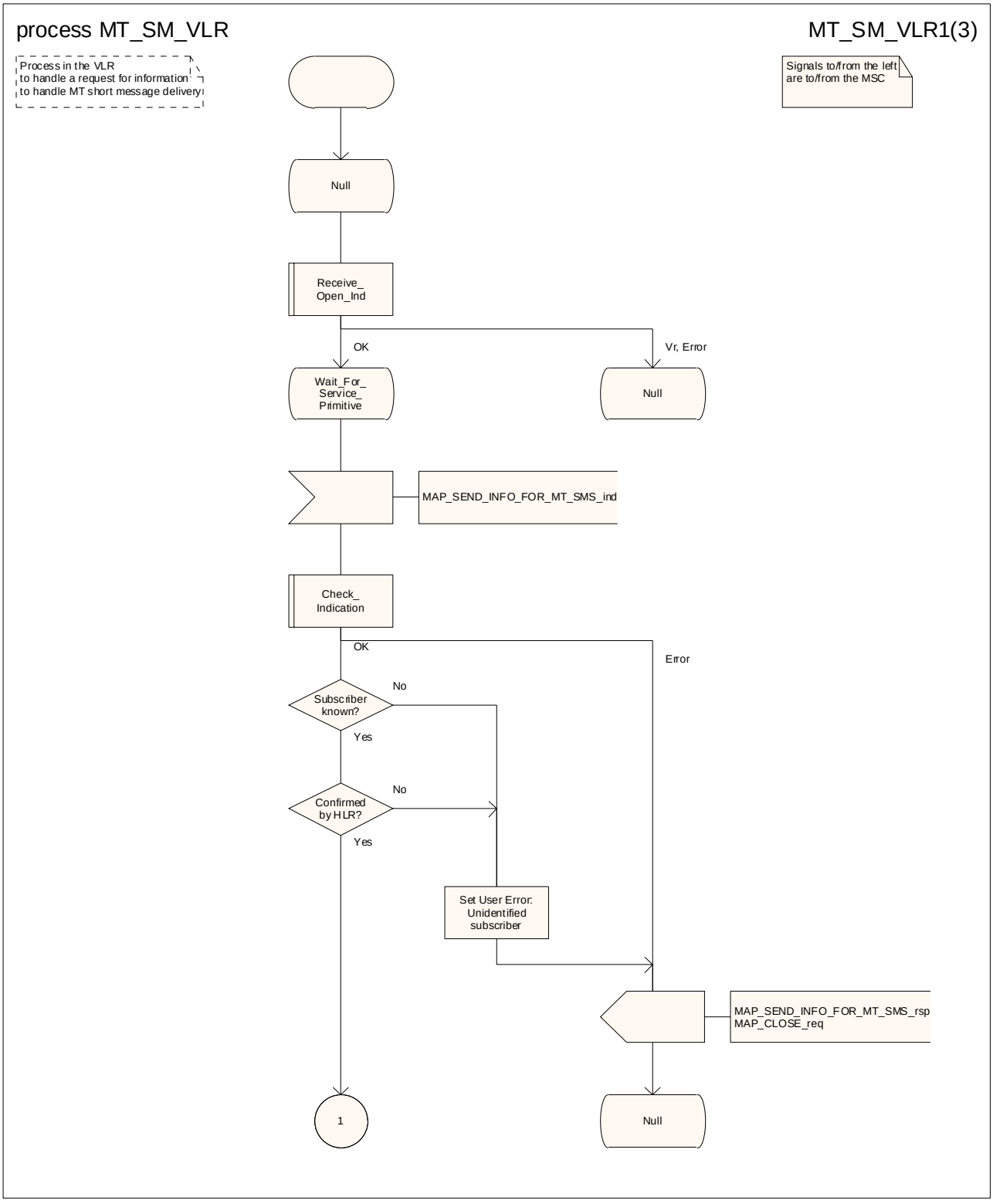
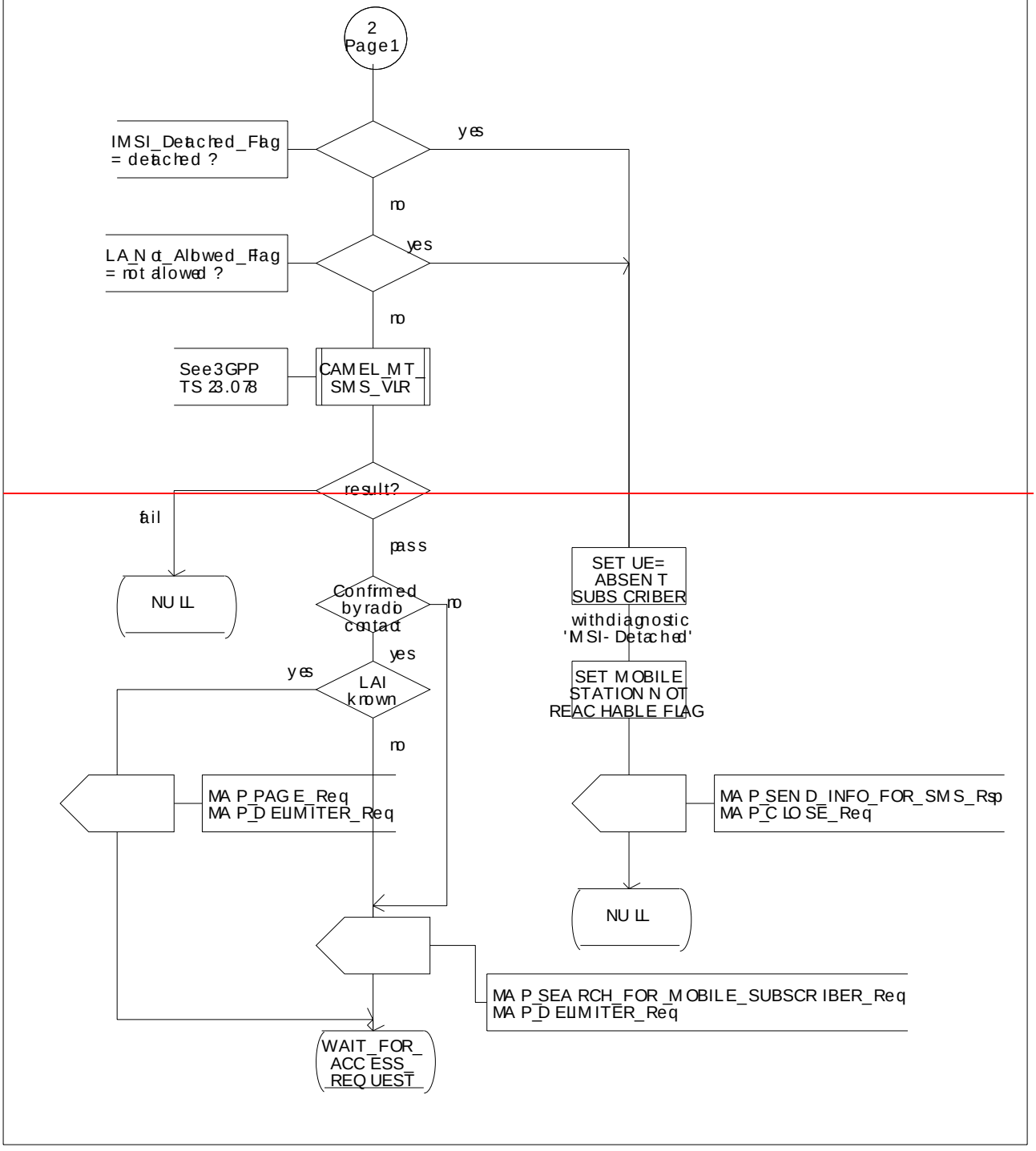


Figure ~~23.3/5~~23.3/9 (sheet 1 of 3): Process MT_SM_VLR

Process MT_SM_VLR 23.3_5.2(3)

Figure 23.3/5: The mobile terminated short message service process in the VLR



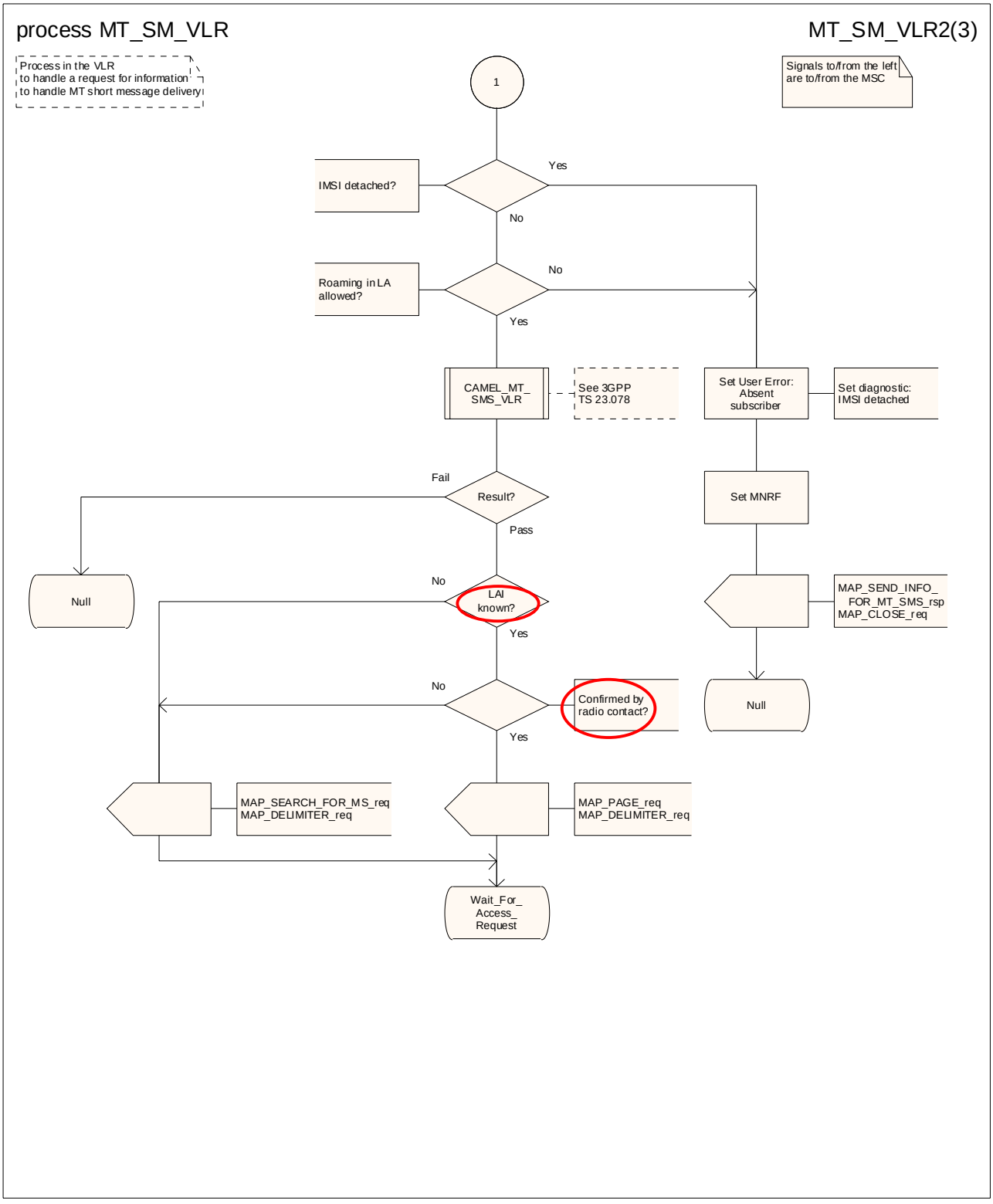
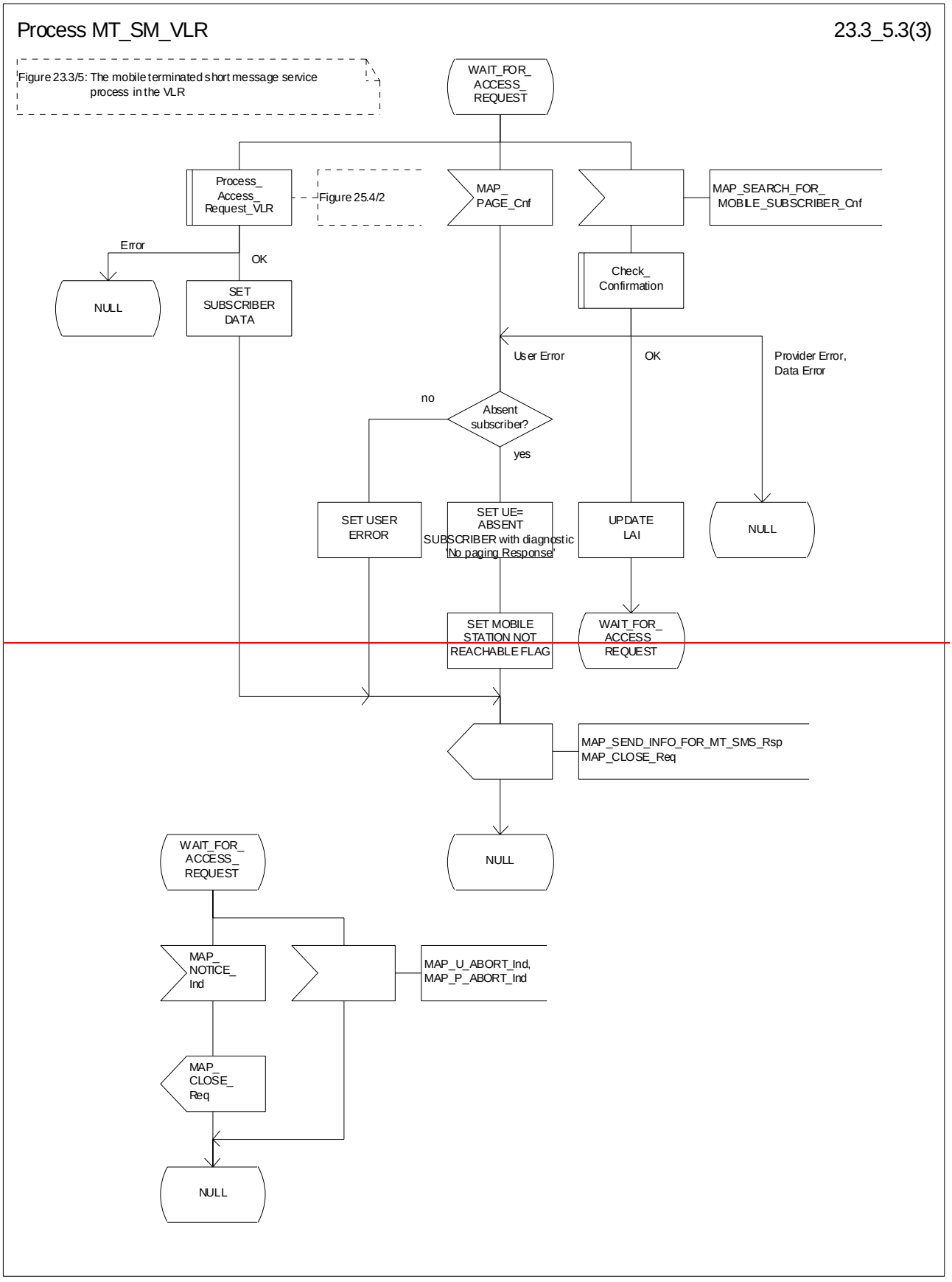


Figure ~~23.3/5~~23.3/9 (sheet 2 of 3): Process MT_SM_VLR


Process MT_SM_VLR
23.3_5.3(3)
Figure 23.3/5: The mobile terminated short message service process in the VLR
WAIT_FOR_ ACCESS_ REQUEST
Process_ Access_ Request_VLR
Figure 25.4/2
MAP_ PAGE_Cnf
MAP_SEARCH_FOR_ MOBILE_SUBSCRIBER_Cnf
Error
OK
NULL
SET SUBSCRIBER DATA
Check_ Confirmation
User Error
OK
Provider Error, Data Error
no
Absent subscriber?
yes
SET USER ERROR
SET UE= ABSENT SUBSCRIBER with diagnostic 'No paging Response'
UPDATE LAI
NULL
SET MOBILE STATION NOT REACHABLE FLAG
WAIT_FOR_ ACCESS_ REQUEST
MAP_SEND_INFO_FOR_MT_SMS_Rsp
MAP_CLOSE_Req
NULL
WAIT_FOR_ ACCESS_ REQUEST
MAP_ NOTICE_ Ind
MAP_U_ABORT_Ind, MAP_P_ABORT_Ind
MAP_ CLOSE_ Req
NULL

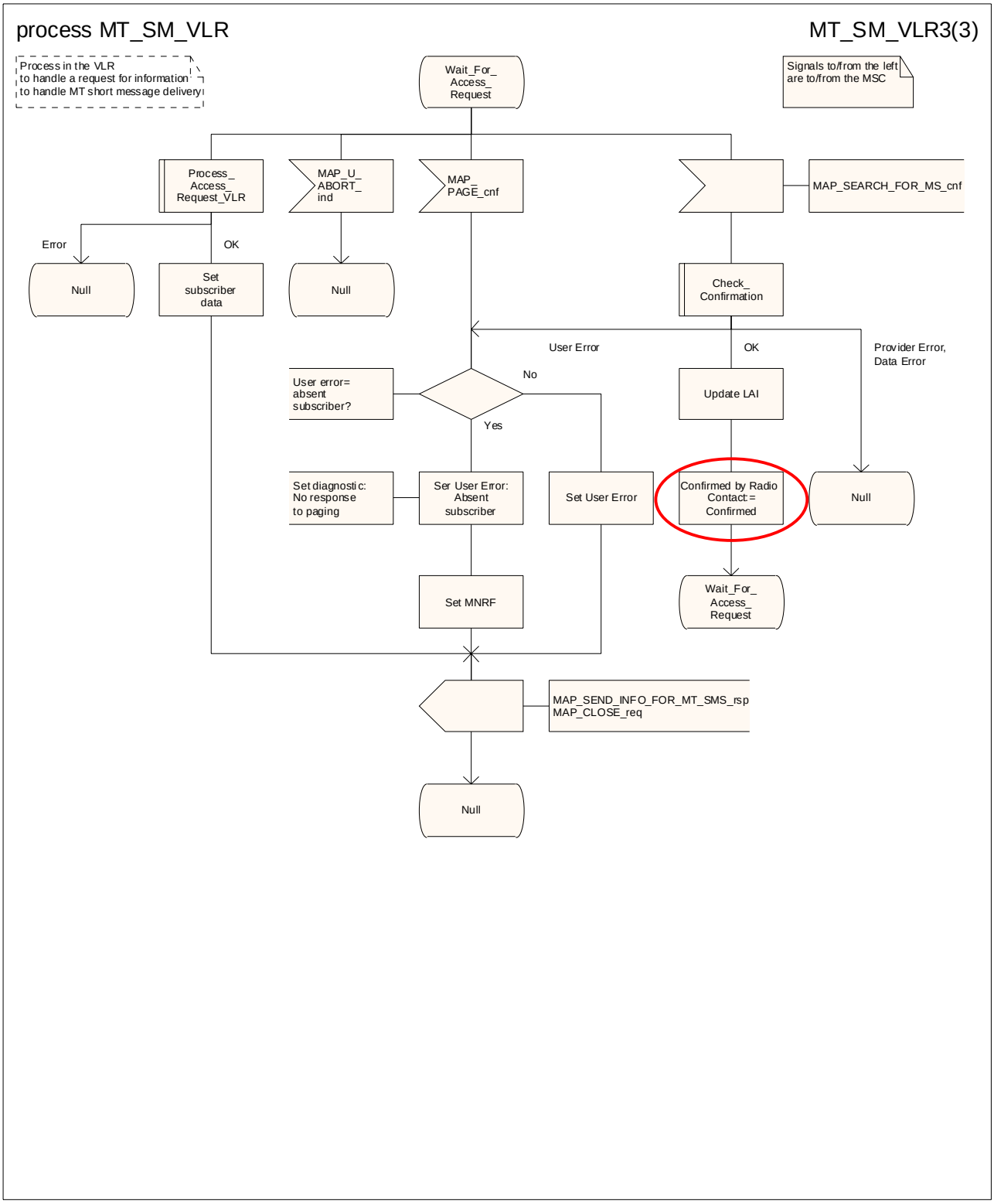


Figure ~~23.3/5~~23.3/9 (sheet 3 ~~t~~of 3): Process MT_SM_VLR

23.3.5 Procedure in the ~~Serving~~ SGSN

Any CAMEL-specific handling defined in this subclause is omitted if the SGSN does not support CAMEL control of MT SMS, or if the subscriber does not have a subscription for CAMEL control of MT SMS.

The process is triggered by a dialogue opening request with the application context shortMsgMT-RelayContext.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the SGSN checks whether the dialogue opening request included a destination reference. If a destination reference was included, the SGSN stores it and waits for a service primitive.
  - if the dialogue with the SMS-GMSC fails, the process returns to the Null state;
  - if the next primitive received is a MAP_DELIMITER indication, the SGSN returns a MAP_DELIMITER request, and waits for a service primitive;
  - if the next primitive received is a MAP_MT_FORWARD_SHORT_MESSAGE indication, the SGSN checks the indication.
    - if the indication is badly formed, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
    - if the indication is OK, the MSC invokes the macro MT_SM_Transfer_SGSN to transfer the short message to the MS.
      - if the macro takes the "Release SMS" exit, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
      - if the macro takes the "Error" exit, the SGSN reports the delivery failure to the gsmSCF (if CAMEL handling was invoked) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
      - if the macro takes the "Abort" exit, the SGSN reports the delivery failure to the gsmSCF (if CAMEL handling was invoked), and the process returns to the Null state;
      - if the macro takes the "OK" exit, the SGSN reports the successful delivery to the gsmSCF (if CAMEL handling was invoked) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".
        - if there are no more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;
        - if there are more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.
- When the SGSN is waiting for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC:
  - if the dialogue with the SMS-GMSC fails, the SGSN releases the LLC connection to the MS, and the process returns to the Null state;
  - if it receives a Release indication over the Gb-interface, the SGSN aborts the dialogue with the SMS-GMSC, and the process returns to the Null state;
  - if it receives a MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC, it checks the indication.

- if the indication is badly formed, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
- if the indication is OK, the SGSN checks whether CAMEL handling is required.
  - if CAMEL handling is required, the SGSN calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.
    - if the result is Release_SMS, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error defined by the gsmSCF, and the process returns to the Null state;
    - if the result is Continue, the SGSN forwards the short message to the MS over the Gb interface, as described below.
  - if CAMEL handling is not required, the SGSN forwards the short message to the MS over the Gb interface, as described below;
- the SGSN sends a Gb_RP_MT_DATA request to the MS, and waits for the response from the MS.

- When the SGSN is waiting for the response from the MS for delivery of a subsequent short message:
  - if the dialogue with the SMS-GMSC fails, the the SGSN releases the LLC connection to the MS and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the SGSN receives a Release indication over the Gb-interface, the MSC aborts the dialogue with the SMS-GMSC and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the SGSN receives an error response from the MS, it maps the error to a MAP user error, reports the delivery failure to the gsmSCF (if CAMEL handling is required) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error, and the process returns to the Null state;
  - if the SGSN receives a positive acknowledgement from the MS, it reports the successful delivery to the gsmSCF (if CAMEL handling is required) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".
    - if there are no more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;
    - if there are more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.

~~When initiating the dialogue with the serving SGSN, the SMS-GMSC must provide the IMSI of the subscriber to whom the short message is directed.~~

~~The IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication.~~

~~When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service user in the serving SGSN issues a MAP_DELIMITER request primitive in order to trigger the local MAP service provider to confirm the dialogue.~~

~~When receiving the first MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-MSC, the serving SGSN performs some subscriber data checks, if the MAP service primitive is accepted and if short message service is supported in the serving SGSN.~~

~~The MAP_MT_FORWARD_SHORT_MESSAGE indication primitive is checked by the macro "Check_Indication". If the received MAP service primitive contains errors, the service is aborted and an unexpected data value error or data missing error is returned to the SMS-GMSC.~~

If the SGSN does not support the short message service, the service is aborted in the serving SGSN and the error "Facility Not Supported" is returned to the SMS-GMSC.

If the connection is GPRS suspended, the SGSN sends to the SMS-GMSC an error specifying that the GPRS connection is suspended.

The subscriber identity information included in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS" as follows:

If the IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication, the MAP_OPEN indication received from the SMS-GMSC shall not include a Destination Reference.

If no Destination Reference has been received and the sm-RP-DA information field does not include an IMSI the service is aborted in the serving SGSN and the error "Unexpected Data Value" is returned to the SMS-GMSC.

The following outcomes from the subscriber data checks can occur in SGSN:

- if the mobile subscriber is unknown, the unidentified subscriber error is forwarded to the SMS-GMSC;
- if the “Confirmed by HLR” indicator is set to “Not Confirmed”, the unidentified subscriber error is forwarded to the SMS-GMSC.
- if the GPRS Detached Flag is set to detached or the LA Not Allowed Flag is set to not allowed in the SGSN, an absent subscriber error with the diagnostic indication set to 'GPRS Detached' is forwarded to the SMS-GMSC and the MS not reachable for GPRS (MNRG) flag is set;
- If the location area identification is known and the "Confirmed by Radio Contact" indicator is set to "Confirmed", the paging procedure is invoked. Otherwise the search procedure is invoked.

After the subscriber data checks the SGSN checks whether a CAMEL dialogue should be opened as specified in 3GPP TS 23.078. If required, the SGSN opens a CAMEL dialogue as specified in 3GPP TS 23.078. If the CAMEL service bars the MT SM then the failure is reported to the SMS-GMSC, and the MT SM is not delivered to MS.

The result of the paging or the search procedure is processed as follows:

- if the procedure is completed successfully, the SGSN may trigger the Authentication, Ciphering and IMEI check procedures (see clauses 25.4 and 25.5). Then, if the procedures are completed successfully, the SGSN will send the short message to the MS;
- if the procedure is completed successfully, but the MS has no mobile terminated short message transfer capability, the SM delivery failure indication with cause "equipment not SM equipped" is provided to the SMS-GMSC. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;
- if the procedure is ended unsuccessfully because the subscriber is already busy for SMS or engaged in location updating or inter SGSN routing area update, the SGSN sends a subscriber busy for MT SMS error to the SMS-GMSC. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;
- if the procedure is ended unsuccessfully because there is no response to paging, the SGSN sends an absent subscriber_SM error to the SMS-GMSC with the absent subscriber diagnostic indication set to 'No Paging Response for GPRS'; if the location area is unknown, the SGSN sends a system failure error to the SMS-GMSC. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078.

If forwarding of the short message is initiated, the SGSN awaits the result before one of the following responses is sent back to the SMS-GMSC:

- an acknowledgement if the short message has been successfully delivered to the mobile subscriber. The successful MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;
- an SM delivery failure error containing a parameter indicating either of the following: there is a MS protocol error or the MS memory capacity is exceeded; detailed diagnostic information (see clause 7.6.1.4) may also be carried. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;
- a system failure error if the delivery procedure is aborted. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078.

~~If the More Messages To Send flag was FALSE or the service MAP_MT_FORWARD_SHORT_MESSAGE ends unsuccessfully, the transaction to the SMS-GMSC is terminated. If the More Messages To Send flag was TRUE, then the serving SGSN waits for the next short message from the Service Centre.~~

~~When receiving the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC the serving SGSN will act as follows:~~

- ~~if the received primitive contains errors, the unexpected data value error or data missing error is provided to the SMS-GMSC;~~
- ~~the SGSN opens a CAMEL dialogue as specified in 3GPP TS 23.078 for each SM. If the CAMEL service bars the MT-SM then the failure is reported to the SMS-GMSC, and the MT-SM is not delivered to the MS.~~
- ~~if the More Messages To Send flag is FALSE, the serving SGSN will start the short message transfer procedure to the mobile subscriber. The successful or unsuccessful outcome of this procedure is reported to the gsmSCF as specified in 3GPP TS 23.078 and to the SMS-GMSC, and the transaction is terminated.~~
- ~~if the More Messages To Send flag is TRUE, the serving SGSN will start the short message transfer to the mobile subscriber. If the outcome of this procedure is unsuccessful, the SM delivery failure is reported to the gsmSCF and the reason is reported to the SMS-GMSC and the procedure is terminated. If the procedure is successful, then the MT-SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078, and it is acknowledged to the SMS-GMSC and more short messages can be received.~~

The mobile terminated short message transfer procedure in the serving SGSN is shown in figure~~s 23.3/9~~23.3/10 ~~and 23.3/10~~.

The macro MT_SM_Transfer_SGSN is used to transfer the first MT short message of a possible sequence of messages.

If the SGSN does not support MT SMS, it sets the User Error to "Facility not supported" and the macro takes the "Error" exit.

If the SGSN supports MT SMS, it invokes the macro Check_Subscr_Identity_for_SMS.

- if the macro Check_Subscr_Identity_for_SMS takes the "Error" exit, the macro MT_SM_Transfer_SGSN takes the "Error" exit;
- if the macro Check_Subscr_Identity_for_SMS takes the "OK" exit, the SGSN checks the subscription information.
  - if the SGSN has no record for the subscriber, or the subscriber record is marked as not confirmed by the HLR, the SGSN sets the User Error to "Unidentified subscriber", and the macro takes the "Release SMS" exit;
  - if the subscriber is marked as GPRS detached, or service is not allowed in the routeing area where the subscriber is currently registered, the SGSN sets the User Error to "Absent subscriber" with the diagnostic "GPRS detached" and sets the MNRG flag, and the macro takes the "Release SMS" exit.
- if the subscription checks are successful, the SGSN calls the procedure CAMEL_MT_SMS_SGSN, which is specified in 3GPP TS 23.078 [98], and checks the result.
  - if the result is Continue, the SGSN sets the variable CAMEL Handling to False, and continues the processing for the delivery attempt;
  - if the result is CAMEL Handling, the SGSN sets the variable CAMEL Handling to True, calls the procedure CAMEL_T_SMS_INIT and checks the result.
    - if the result is Release_SMS, the SGSN sets the User Error according to the instructions from the gsmSCF, and the macro takes the "Release SMS" exit;
    - if the result is Continue, the SGSN continues the processing for the delivery attempt.
- the SGSN checks whether the location of the MS is known, and whether the location is confirmed by radio contact.
  - if the location is known and confirmed by radio contact, the SGSN calls the procedure Page_SMS_SGSN and checks the result;

- if the location is not known, or not confirmed by radio contact, the SGSN calls the procedure Search_SMS_SGSN and checks the result.

- if the procedure Page_SMS_SGSN or the procedure Search_SMS_SGSN returns a Fail result, the SGSN checks the error cause.

  - if the error cause is Absent Subscriber, the SGSN sets the User Error to "Absent Subscriber" with the diagnostic "No response to paging" and sets the MNRG flag, and the macro takes the "Error" exit;

  - for any other error, the SGSN sets the User Error accordingly, and the macro takes the "Error" exit.

- if the procedure Page_SMS_SGSN or the procedure Search_SMS_SGSN returns a Fail result, the SGSN checks whether the MS supports SMS.

  - if the MS does not support SMS, the SGSN releases the LLC connection and sets the User Error to "SM delivery failure" with delivery failure cause "Equipment not SM equipped", and the macro takes the "Error" exit;

  - if the MS supports SMS, the SGSN forwards the short message to the MS, and waits for a response from the MS.

    - if the MS returns an error, the SGSN sets the User Error according to the response from the MS, and the macro takes the "Error" exit;

    - if the MS returns a positiva acknowledgement, the macro takes the "OK" exit;

    - if the LLC connection is released, the SGSN sets the User Error to "System failure", and the macro takes the "Error" exit;

    - if the dialogue with the SMS-GMSC fails, the SGSN releases the LLC connection, and the macro takes the "Abort" exit.

The macro MT_SM_Transfer_SGSN is shown in figure 23.3/11

The page and search procedures are shown in figures ~~23.3/10a~~23.3/12 and ~~23.3/10b~~23.3/13.

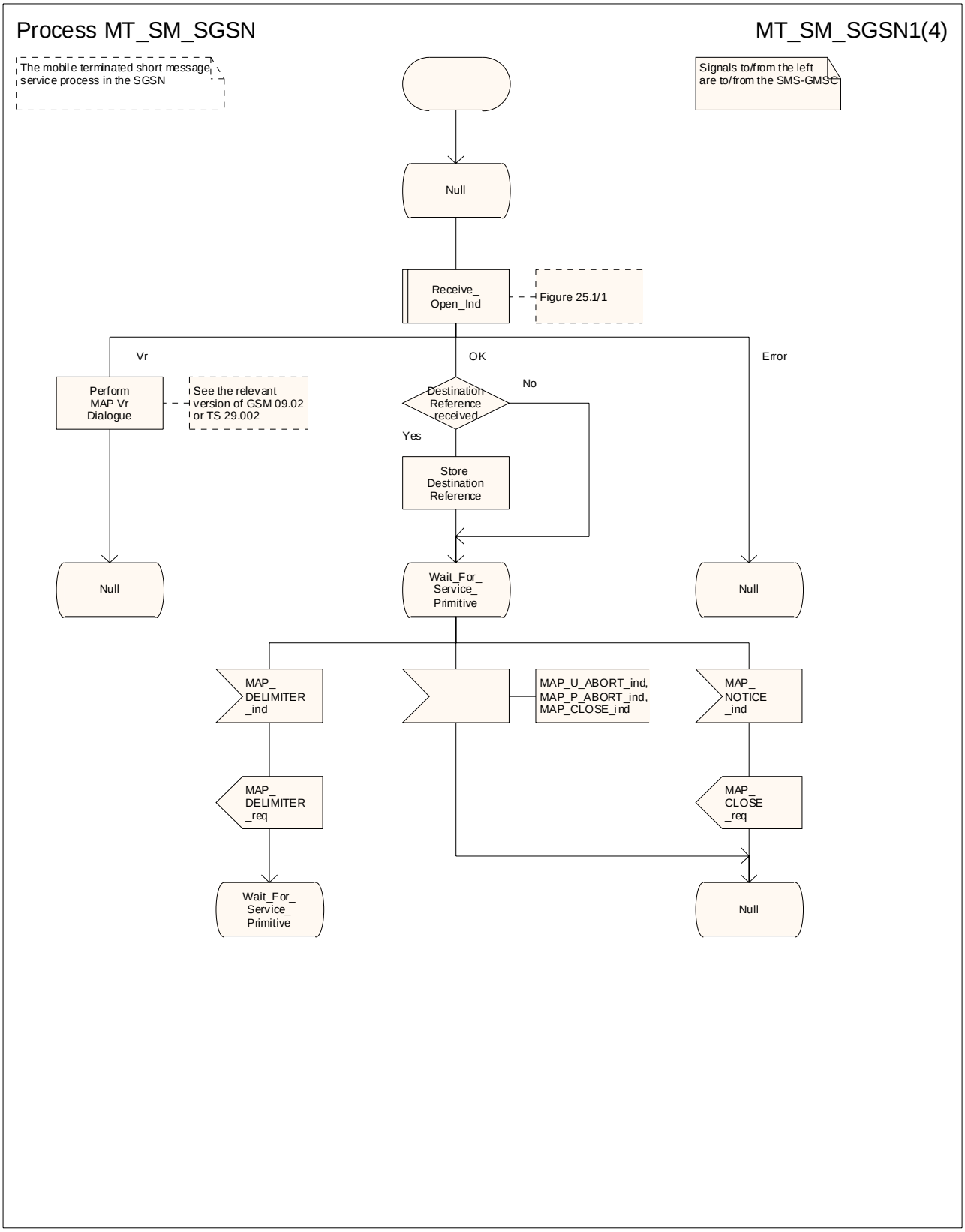


Figure ~~23.3/9~~23.3/10 (sheet 1 of 4): Process MT_SM_SGSN

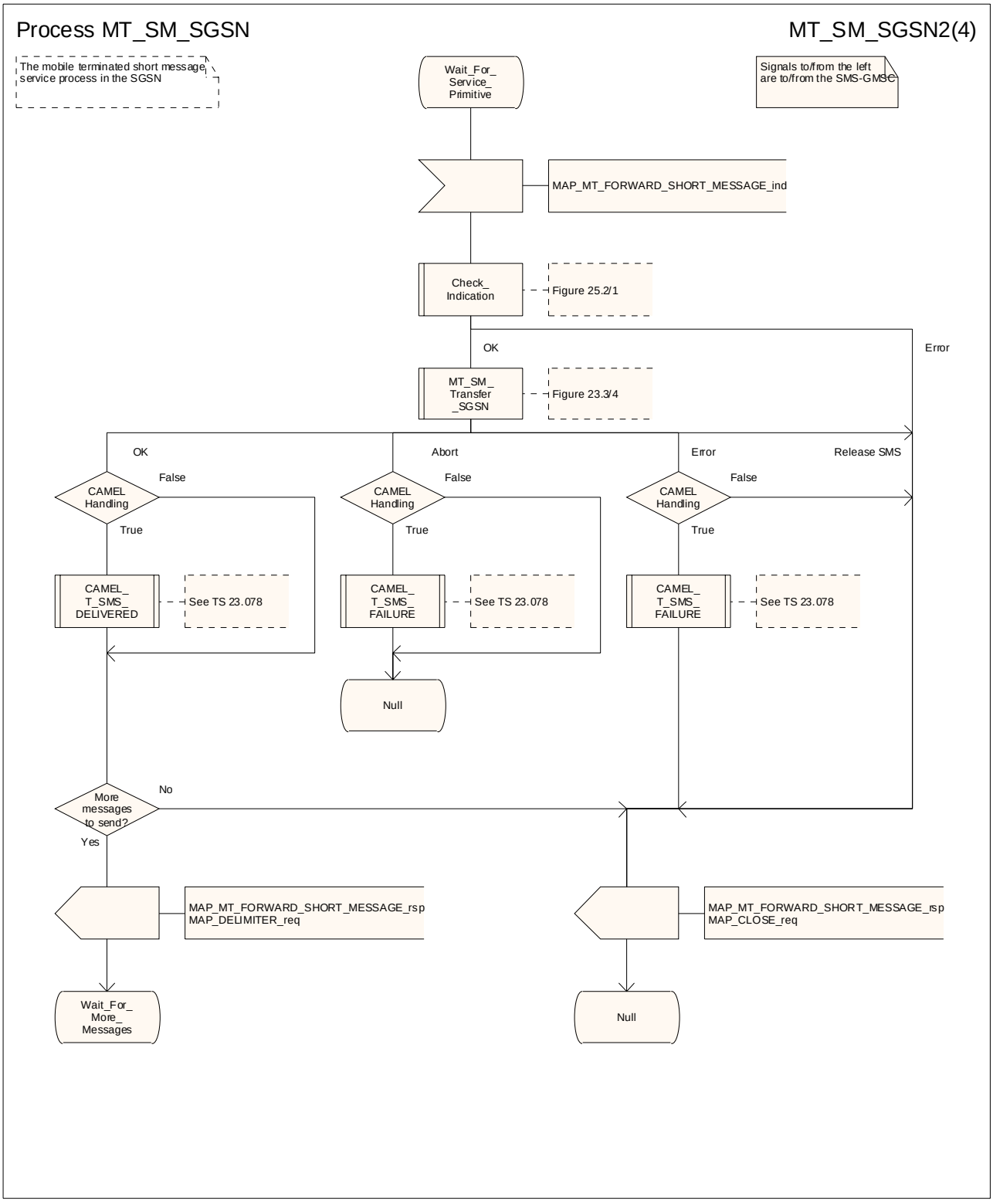
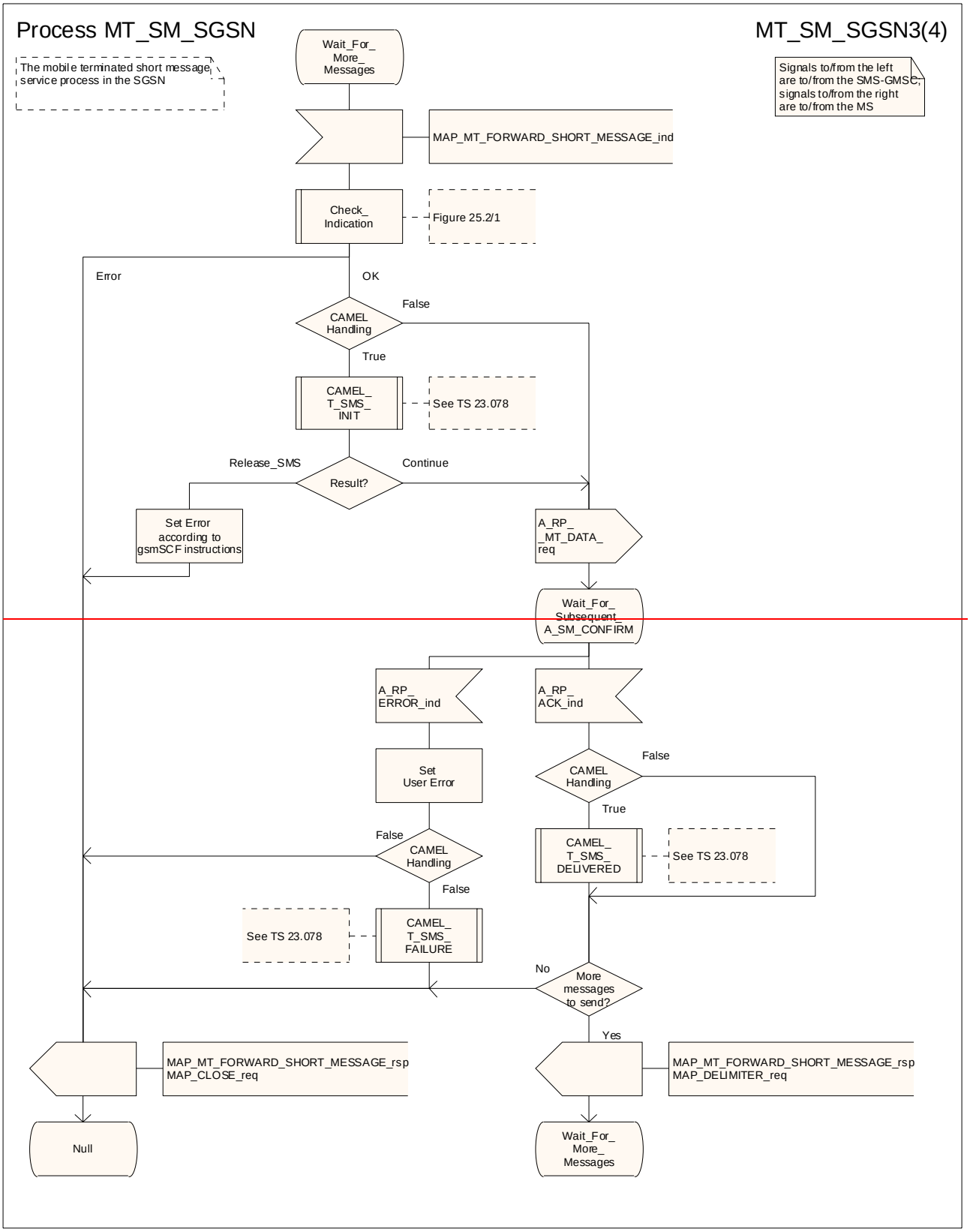


Figure ~~23.3/9~~23.3/10 (sheet 2 of 4): Process MT_SM_ SGSN


Process MT_SM_SGSN
MT_SM_SGSN3(4)
The mobile terminated short message service process in the SGSN
Signals to/from the left are to/from the SMS-GMSC, signals to/from the right are to/from the MS
Wait_For_ More_ Messages
MAP_MT_FORWARD_SHORT_MESSAGE_ind
Check_ Indication
Figure 25.2/1
Error
OK
CAMEL Handling
False
True
CAMEL_ T_SMS_ INIT
See TS 23.078
Release_SMS
Result?
Continue
Set Error according to gsmSCF instructions
A_RP_ _MT_DATA_ req
Wait_For_ Subsequent_ A_SM_CONFIRM
A_RP_ ERROR_ind
A_RP_ ACK_ind
Set User Error
CAMEL Handling
False
True
False
CAMEL Handling
CAMEL_ T_SMS_ DELIVERED
See TS 23.078
False
See TS 23.078
CAMEL_ T_SMS_ FAILURE
No
More messages to send?
Yes
MAP_MT_FORWARD_SHORT_MESSAGE_rsp MAP_CLOSE_req
MAP_MT_FORWARD_SHORT_MESSAGE_rsp MAP_DELIMITER_req
Null
Wait_For_ More_ Messages

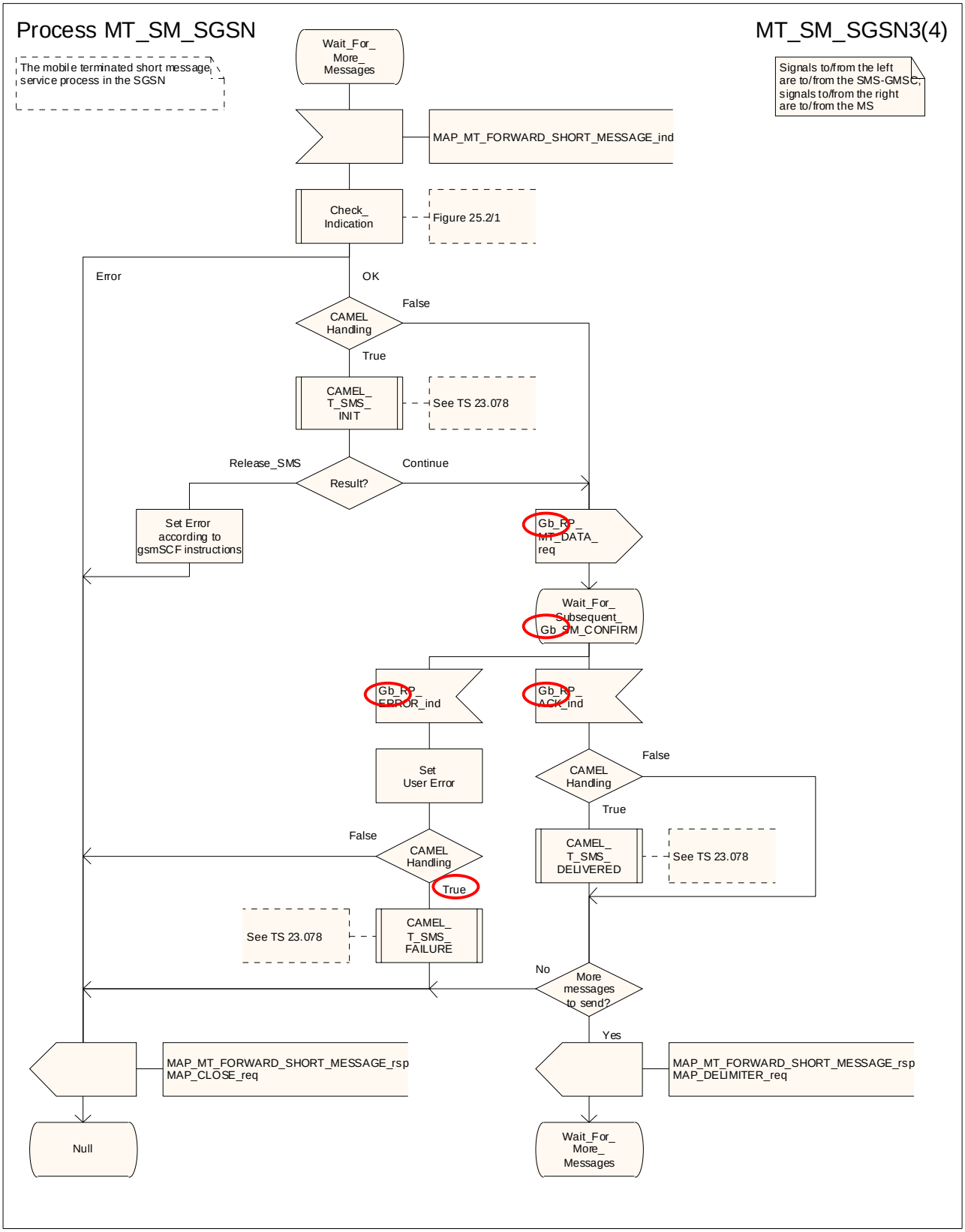
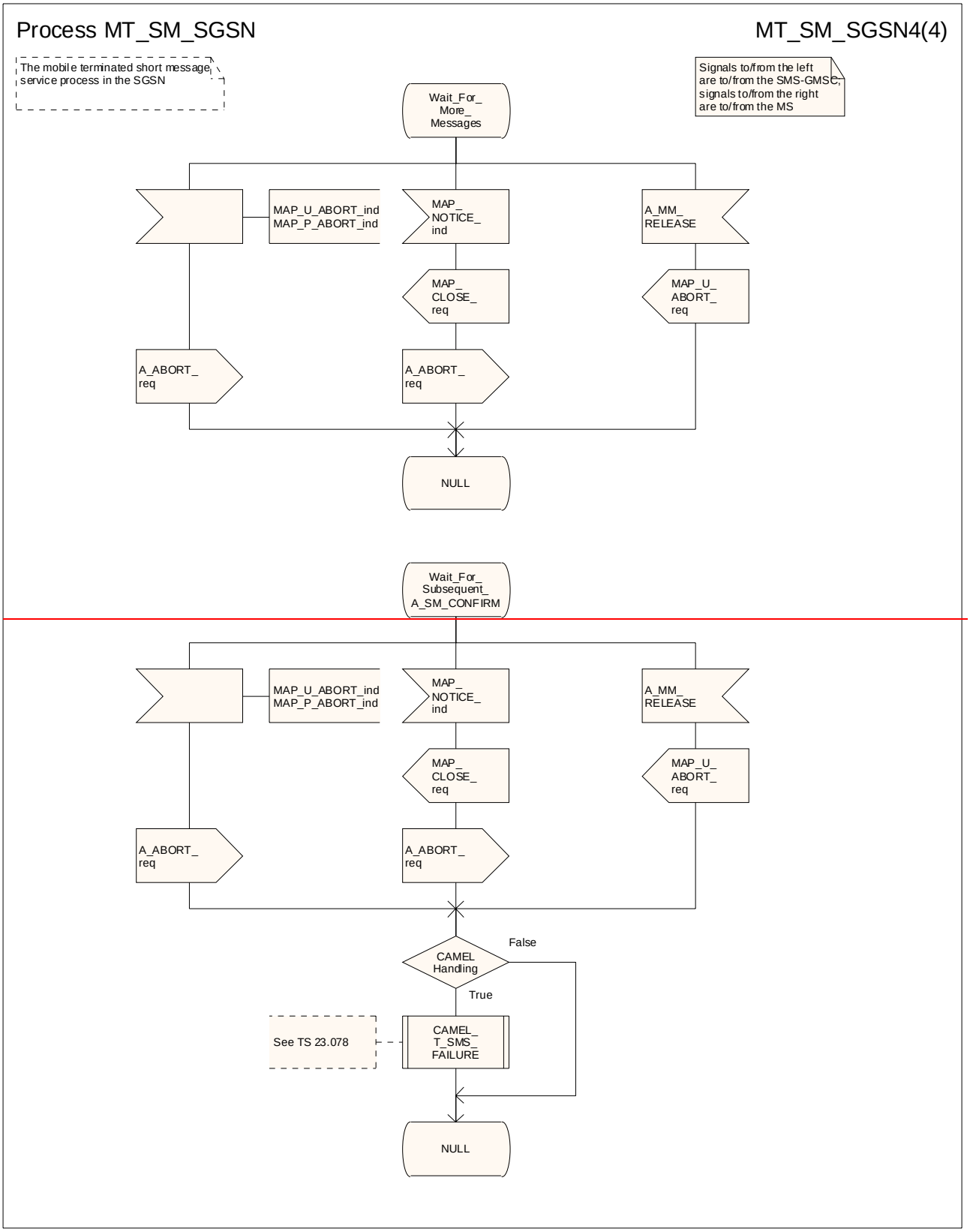


Figure ~~23.3/9~~23.3/10 (sheet 3 of 4): Process MT_SM_ SGSN


Process MT_SM_SGSN
MT_SM_SGSN4(4)
The mobile terminated short message service process in the SGSN
Signals to/from the left are to/from the SMS-GMSC; signals to/from the right are to/from the MS
Wait_For_ More_ Messages
MAP_U_ABORT_ind MAP_P_ABORT_ind
MAP_ NOTICE_ ind
A_MM_ RELEASE
MAP_ CLOSE_ req
MAP_U_ ABORT_ req
A_ABORT_ req
A_ABORT_ req
NULL
Wait_For_ Subsequent_ A_SM_CONFIRM
MAP_U_ABORT_ind MAP_P_ABORT_ind
MAP_ NOTICE_ ind
A_MM_ RELEASE
MAP_ CLOSE_ req
MAP_U_ ABORT_ req
A_ABORT_ req
A_ABORT_ req
CAMEL Handling
False
True
See TS 23.078
CAMEL_ T_SMS_ FAILURE
NULL

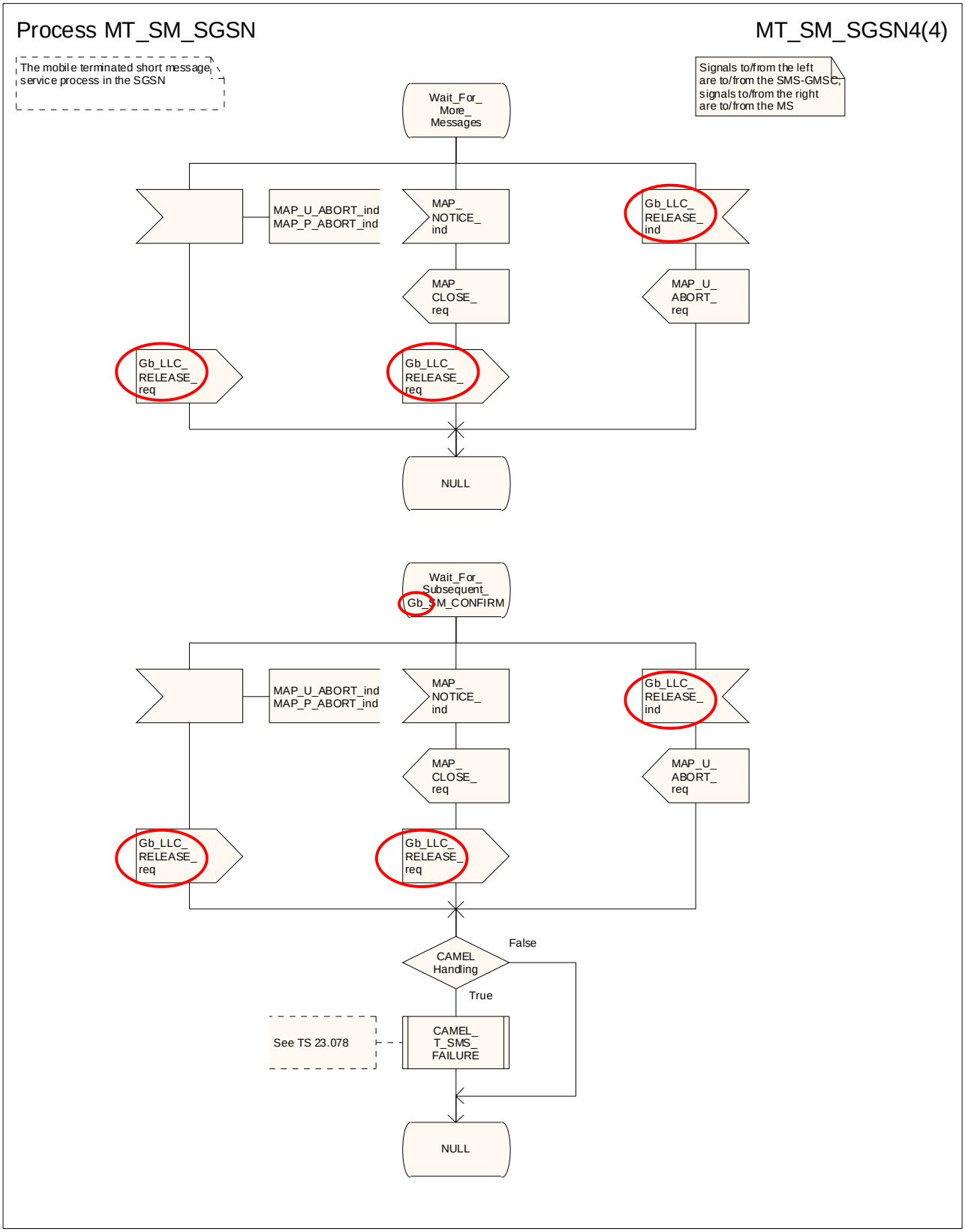
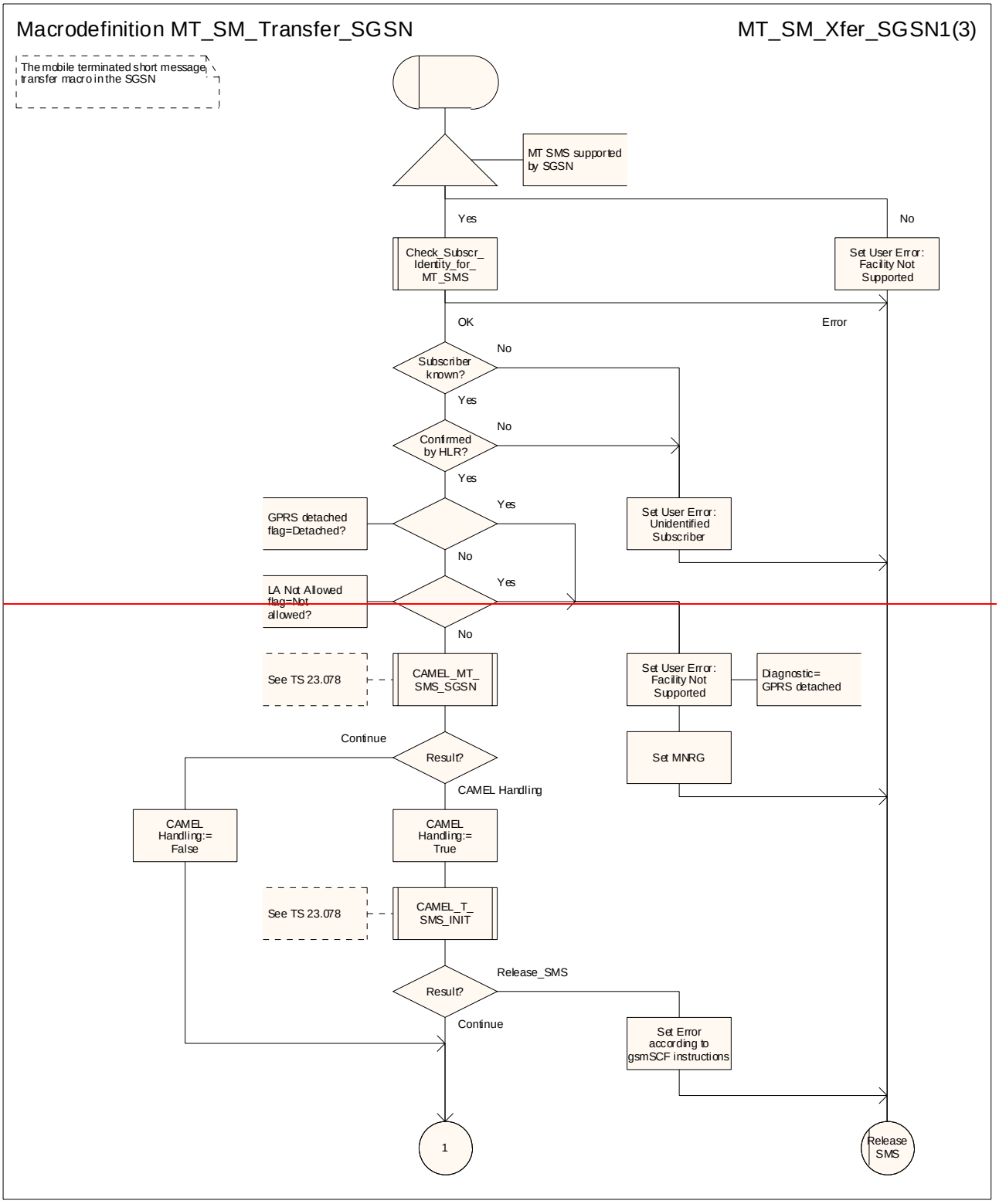


Figure ~~23.3/9~~23.3/10 (sheet 4 of 4): Process MT_SM_ SGSN


Macrodefinition MT_SM_Transfer_SGSN
MT_SM_Xfer_SGSN1(3)
The mobile terminated short message transfer macro in the SGSN
MT SMS supported by SGSN
Yes
No
Check_Subscr_ Identity_for_ MT_SMS
Set User Error: Facility Not Supported
OK
Error
Subscriber known?
No
Yes
Confirmed by HLR?
No
Yes
GPRS detached flag=Detached?
Yes
Set User Error: Unidentified Subscriber
No
LA Not Allowed flag=Not allowed?
Yes
No
See TS 23.078
CAMEL_MT_ SMS_SGSN
Set User Error: Facility Not Supported
Diagnostic= GPRS detached
Continue
Result?
Set MNRG
CAMEL Handling
CAMEL Handling:= False
CAMEL Handling:= True
See TS 23.078
CAMEL_T_ SMS_INIT
Release_SMS
Result?
Continue
Set Error according to gsmSCF instructions
1
Release SMS

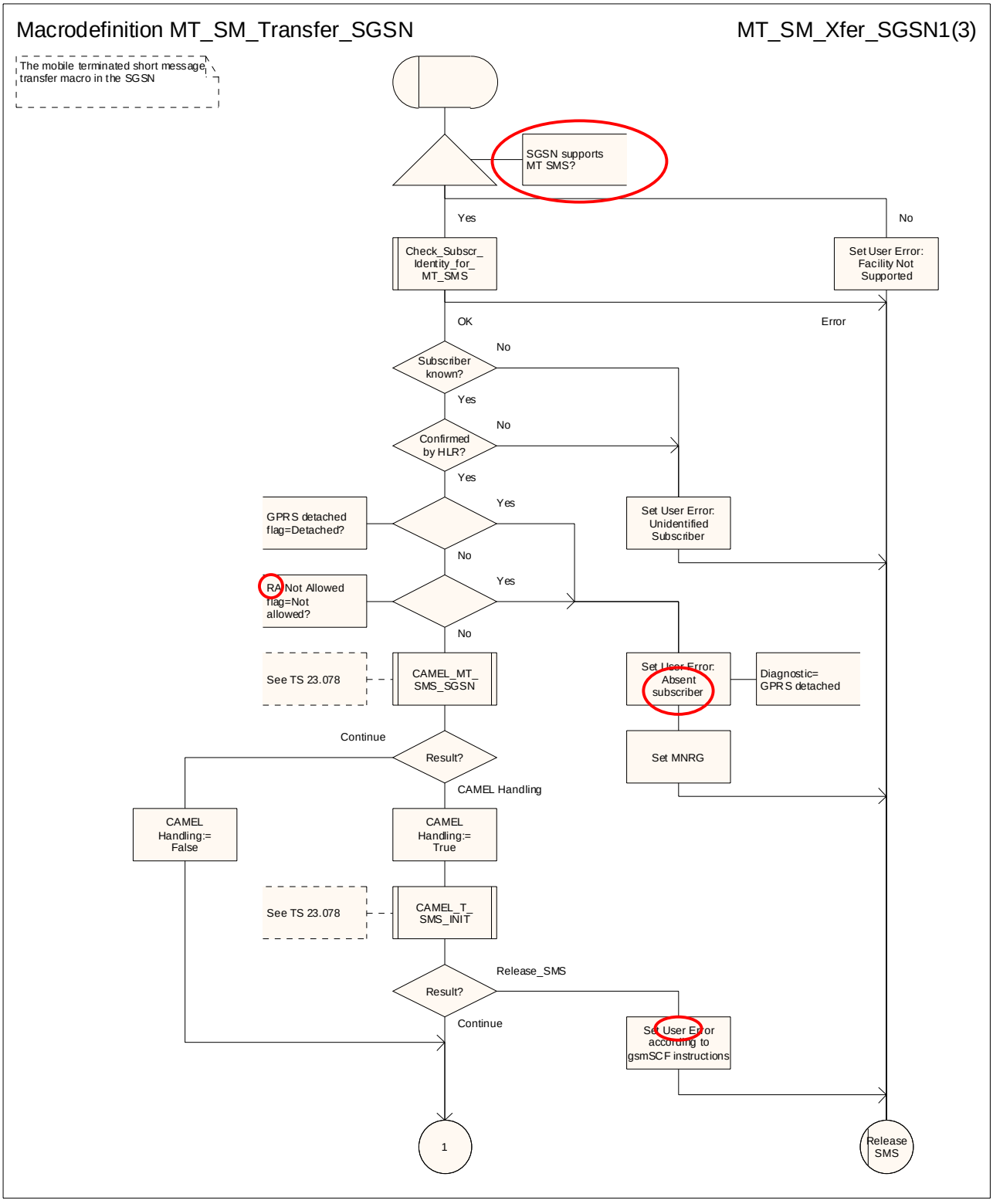
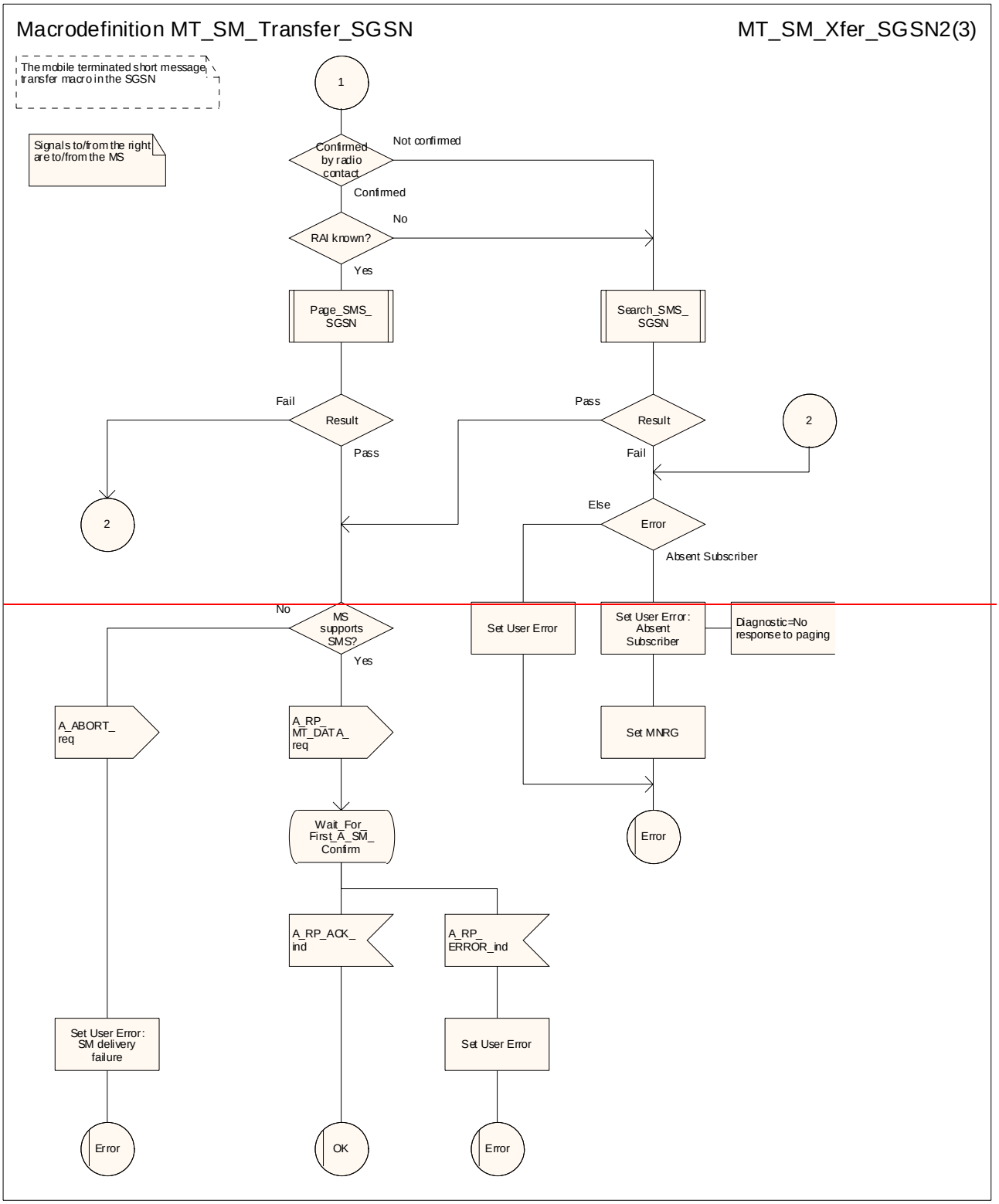


Figure ~~23.3/10~~23.3/11 (sheet 1 of 3): Macro MT_SM_TRANSFER_SGSN


Macrodefinition MT_SM_Transfer_SGSN
MT_SM_Xfer_SGSN2(3)
The mobile terminated short message transfer macro in the SGSN
Signals to/from the right are to/from the MS
1
Confirmed by radio contact
Not confirmed
Confirmed
RAI known?
No
Yes
Page_SMS_ SGSN
Search_SMS_ SGSN
Fail
Result
Pass
Pass
Result
Fail
2
2
Else
Error
Absent Subscriber
No
MS supports SMS?
Yes
Set User Error
Set User Error: Absent Subscriber
Diagnostic=No response to paging
A_ABORT_ req
A_RP_ MT_DATA_ req
Set MNRG
Wait_For_ First_A_SM_ Confirm
Error
A_RP_ACK_ ind
A_RP_ ERROR_ind
Set User Error: SM delivery failure
Set User Error
Error
OK
Error

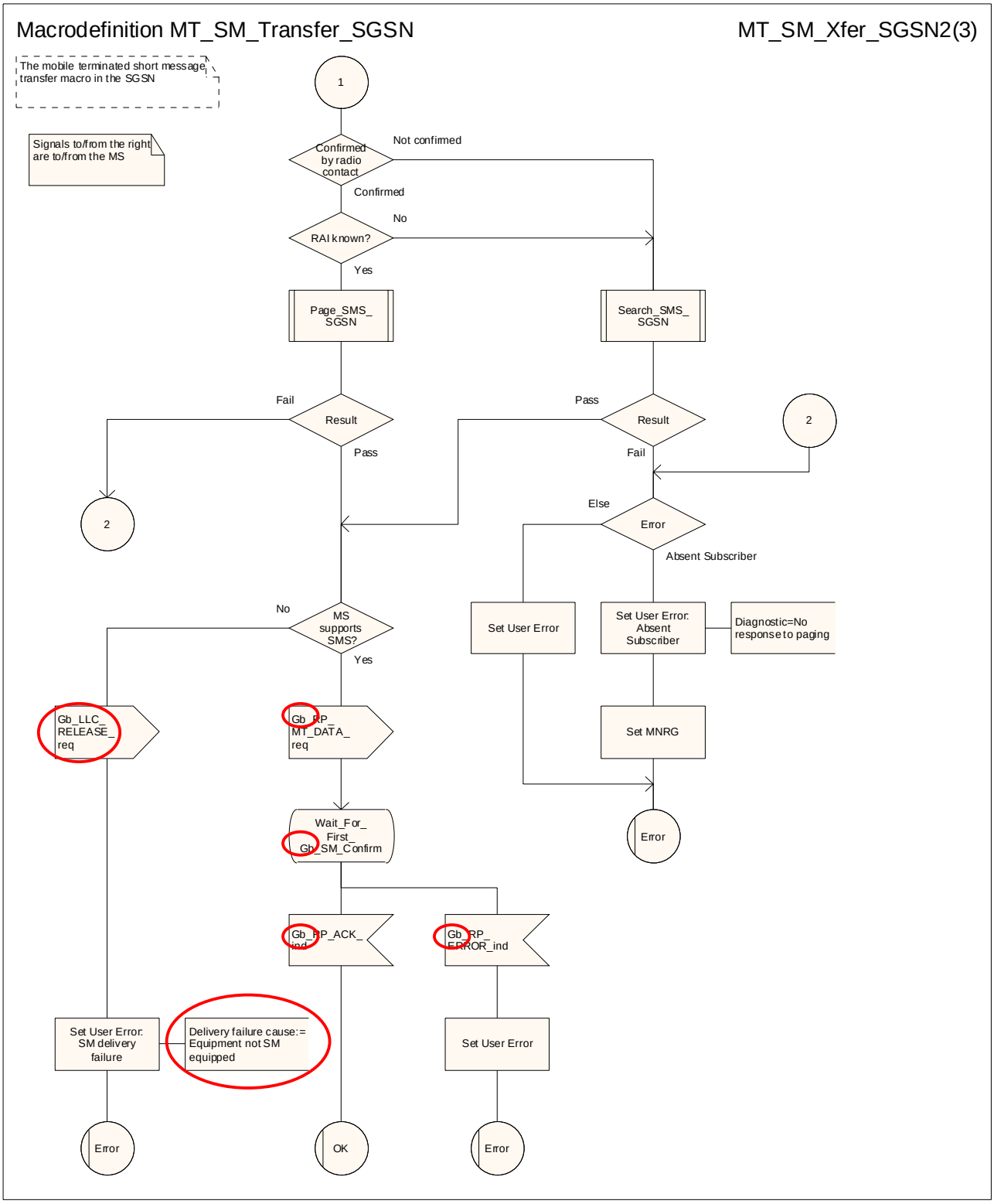
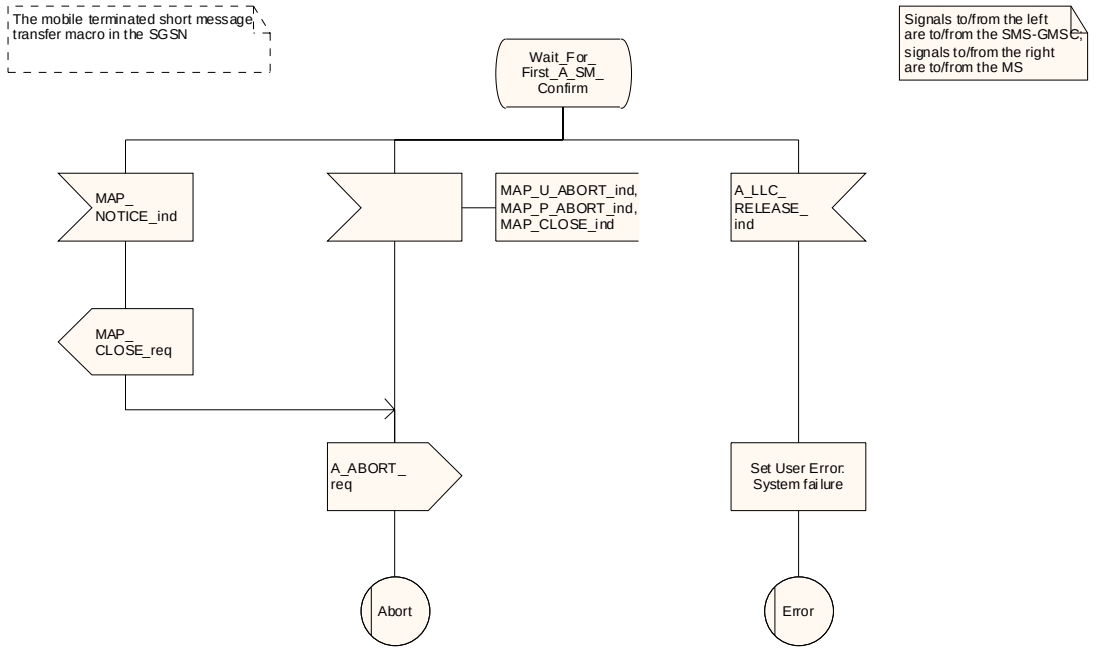


Figure ~~23.3/10~~23.3/11 (sheet 2 of 3): Macro MT_SM_TRANSFER_SGSN

Macrodefinition MT_SM_Transfer_SGSN MT_SM_Xfer_SGSN3(3)



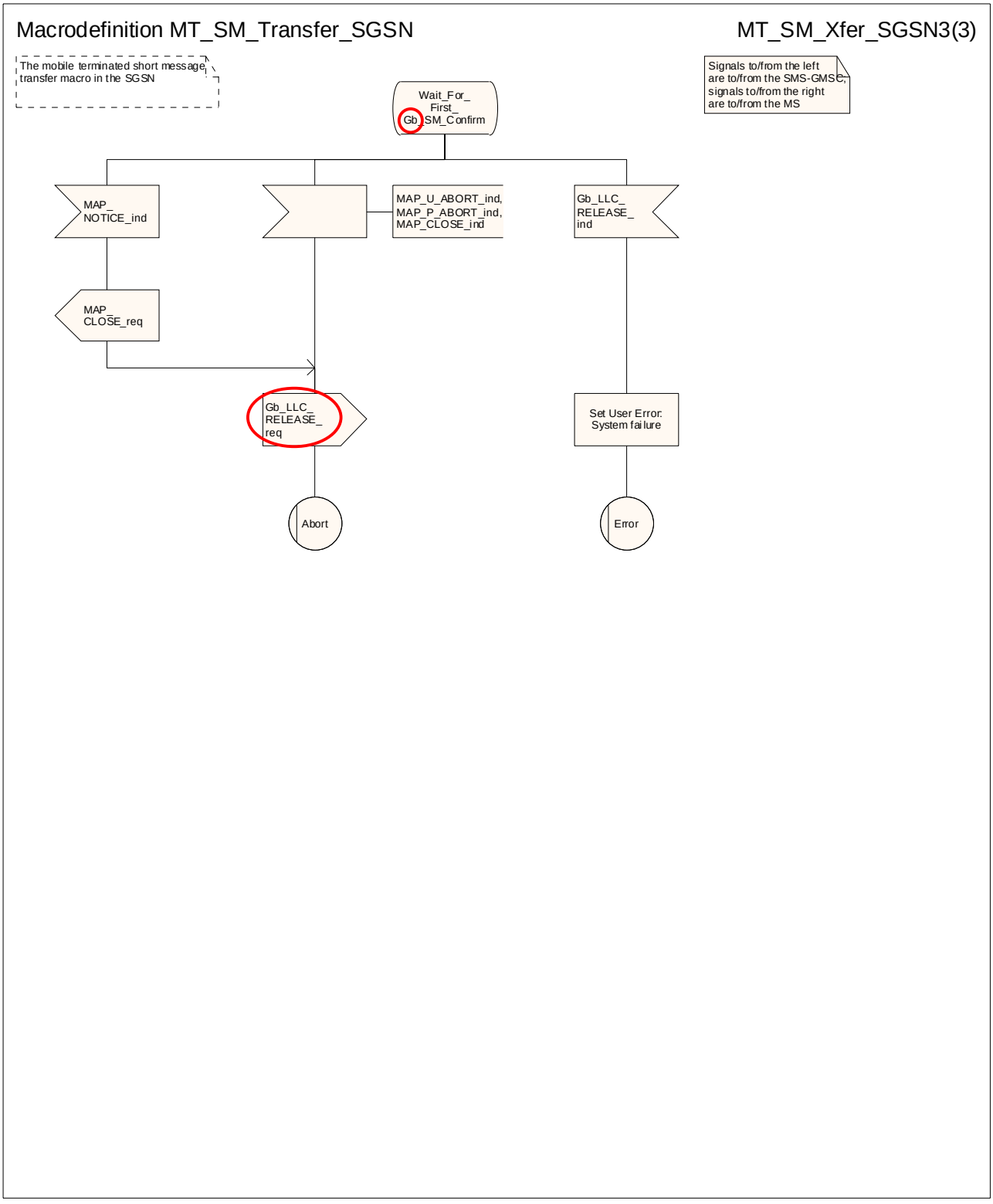
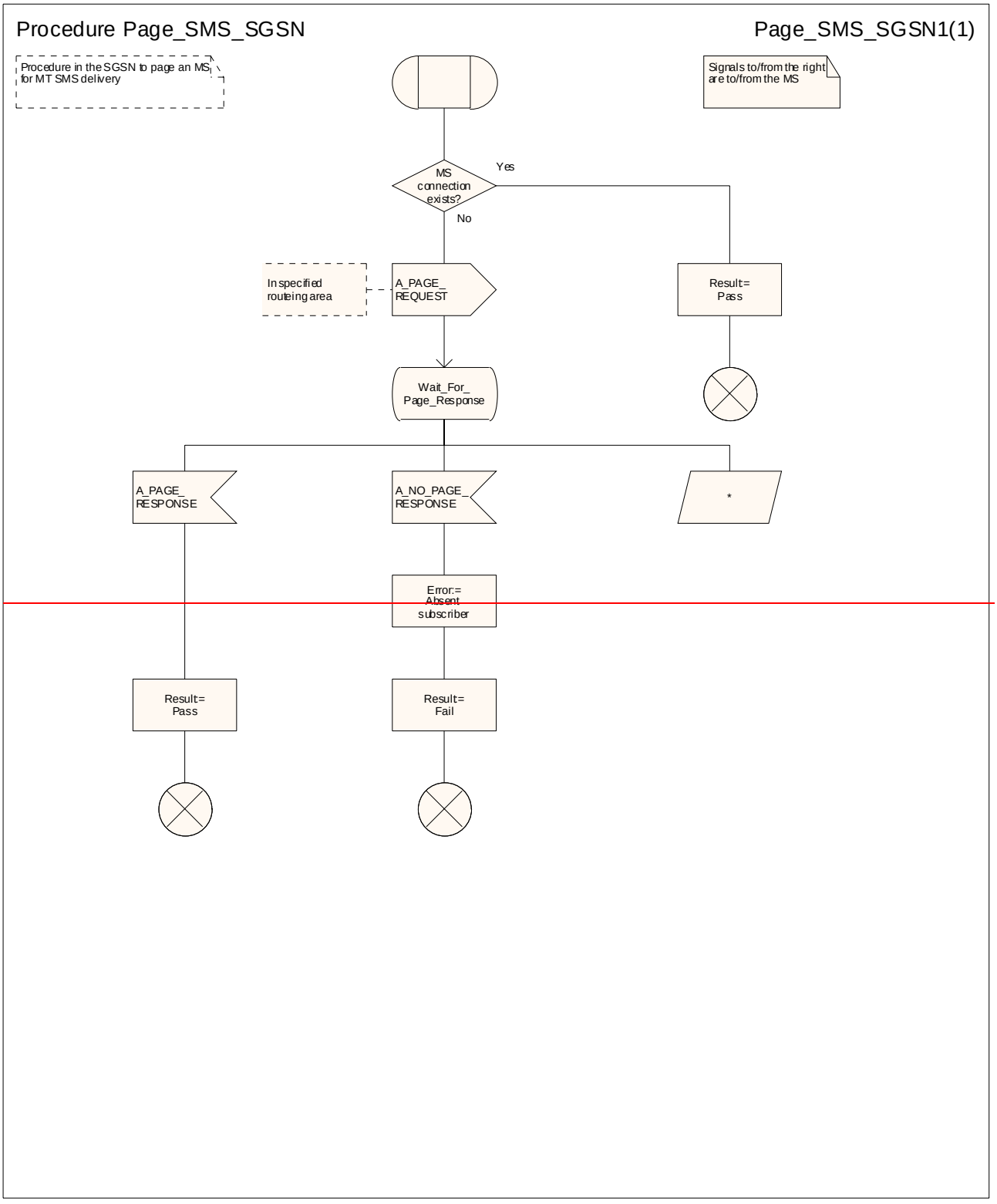


Figure ~~23.3/10~~23.3/11 (sheet 3 of 3): Macro MT_SM_TRANSFER_SGSN


Procedure Page_SMS_SGSN
Page_SMS_SGSN1(1)
Procedure in the SGSN to page an MS for MT SMS delivery
Signals to/from the right are to/from the MS
MS connection exists?
Yes
No
In specified routeing area
A_PAGE_ REQUEST
Result= Pass
Wait_For_ Page_Response
A_PAGE_ RESPONSE
A_NO_PAGE_ RESPONSE
*
Error:= Absent subscriber
Result= Pass
Result= Fail

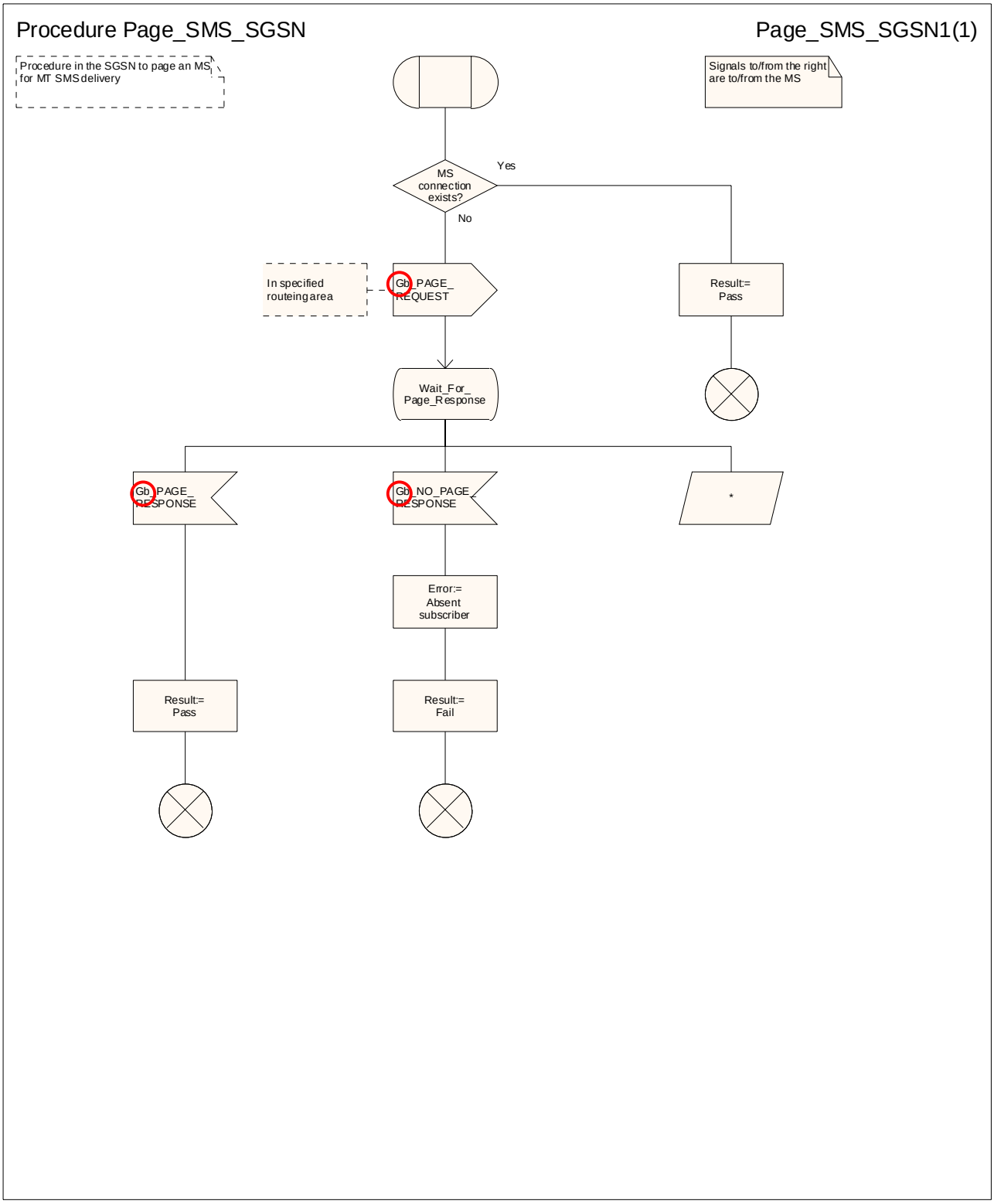
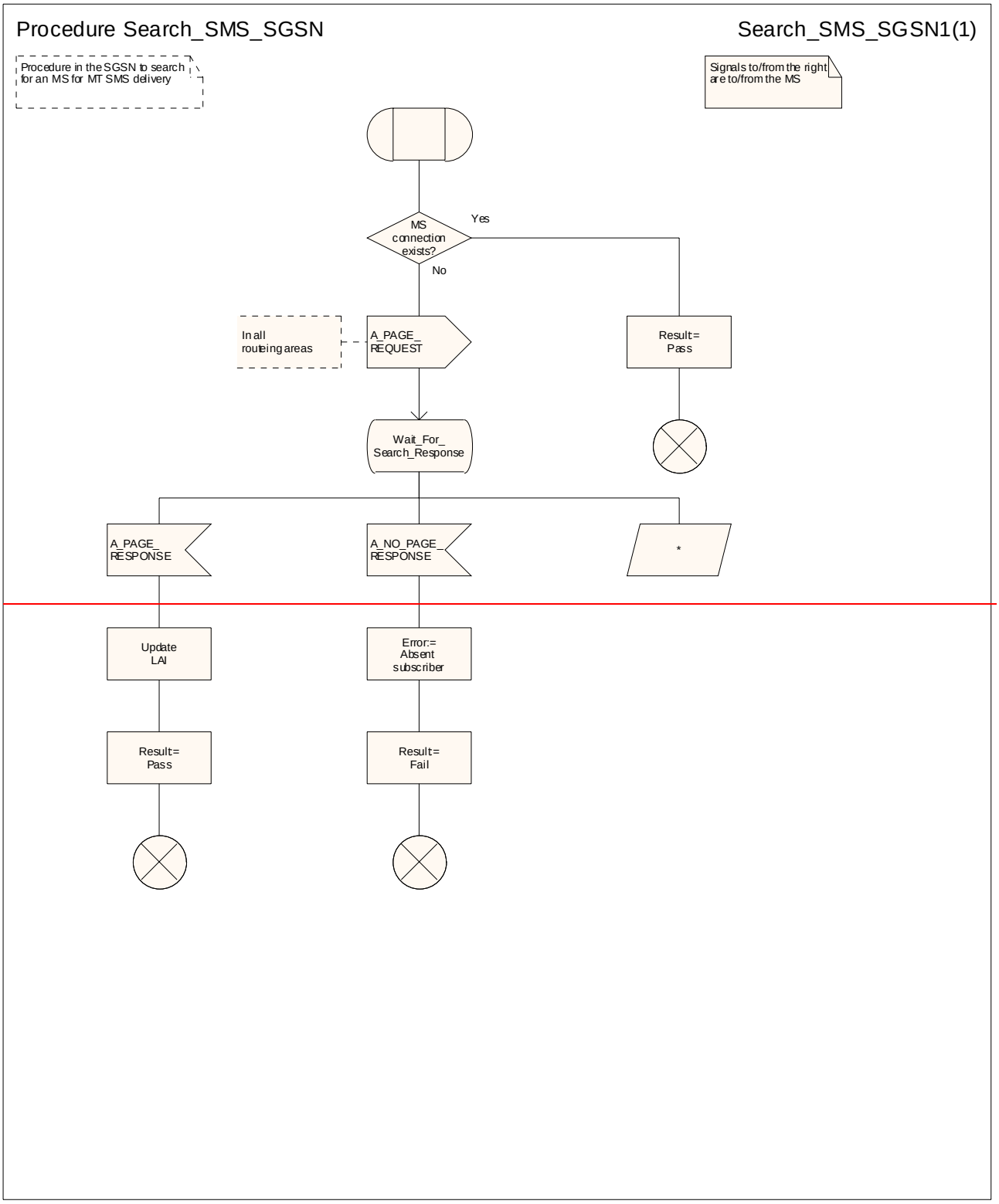


Figure ~~23.3/10a~~23.3/12 (sheet 1 of 1): Procedure Page_SMS_SGSN


Procedure Search_SMS_SGSN
Search_SMS_SGSN1(1)
Procedure in the SGSN to search for an MS for MT SMS delivery
Signals to/from the right are to/from the MS
MS connection exists?
Yes
No
In all routeing areas
A_PAGE_ REQUEST
Result= Pass
Wait_For_ Search_Response
A_PAGE_ RESPONSE
A_NO_PAGE_ RESPONSE
*
Update LAI
Error:= Absent subscriber
Result= Pass
Result= Fail

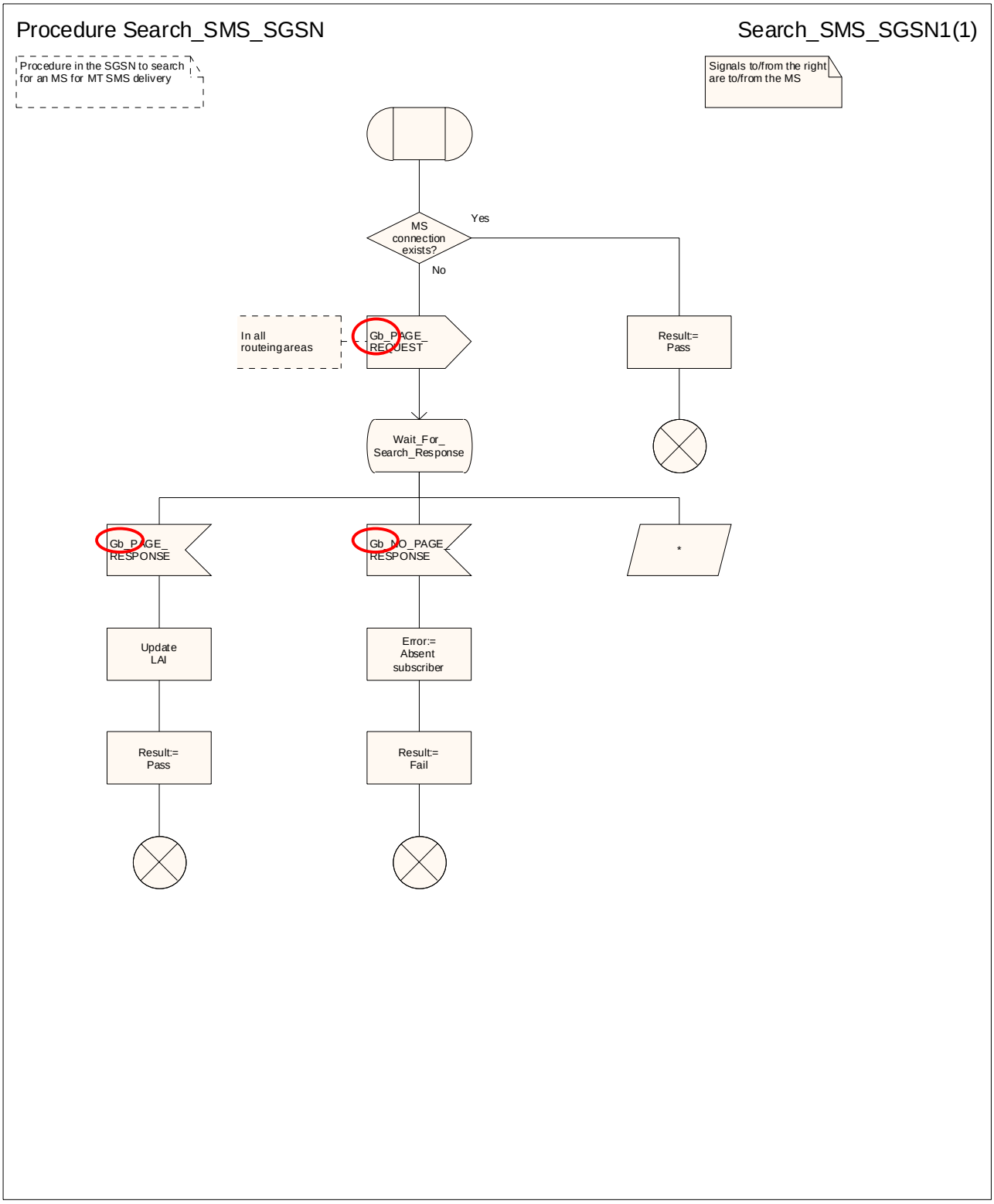
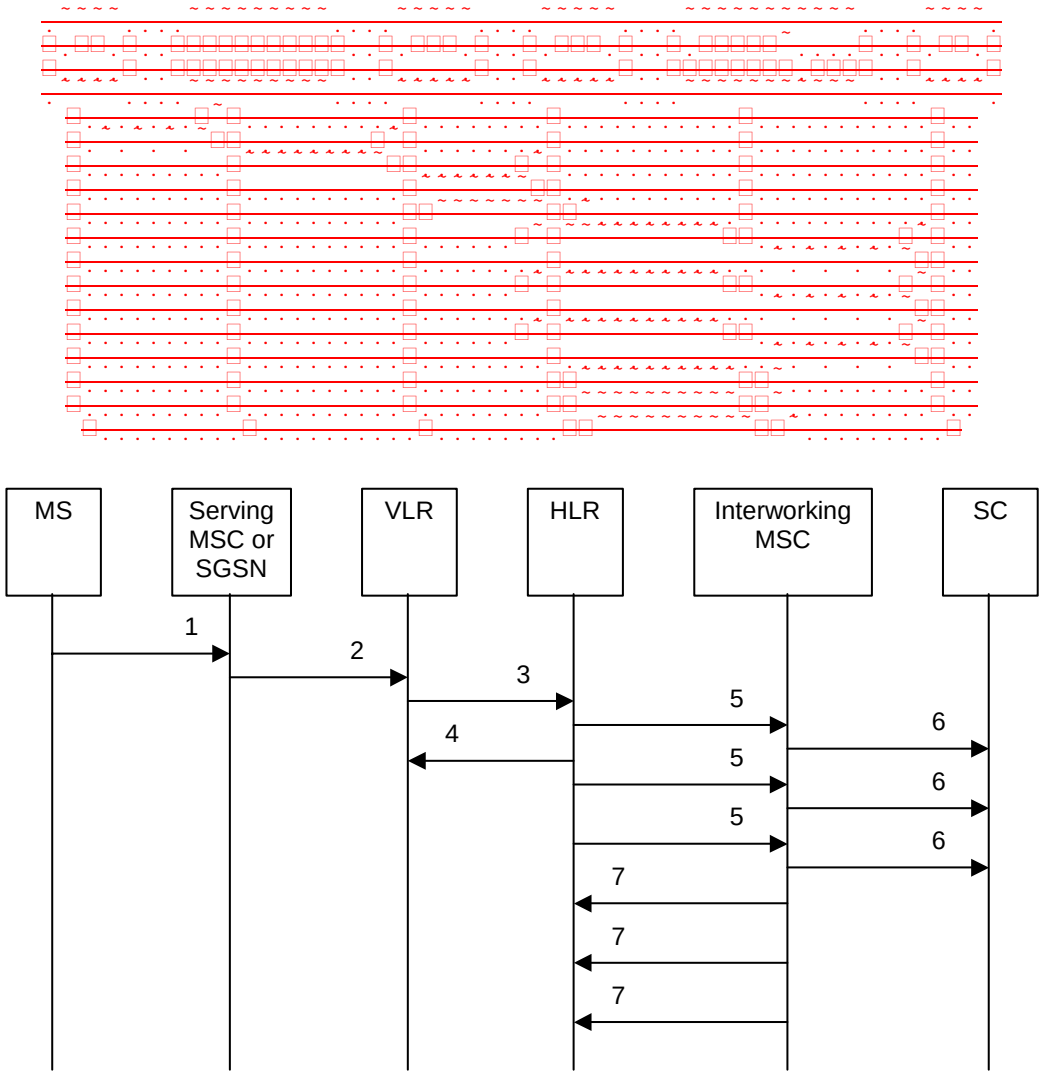


Figure ~~23.3/10b~~23.3/13 (sheet 1 of 1): Procedure Search_SMS_SGSN

23.4 The Short Message Alert procedure

The Short Message Alert procedure is used ~~for~~ to alert~~ing~~ the Service Centre when the mobile subscriber is active after a short message transfer has failed because the mobile subscriber is not reachable, or when the MS has indicated that it has memory capacity to accept a short message.

The message flow for the Short Message Alert procedure for the case when the mobile subscriber was not reachable is shown in figure 23.4/1.



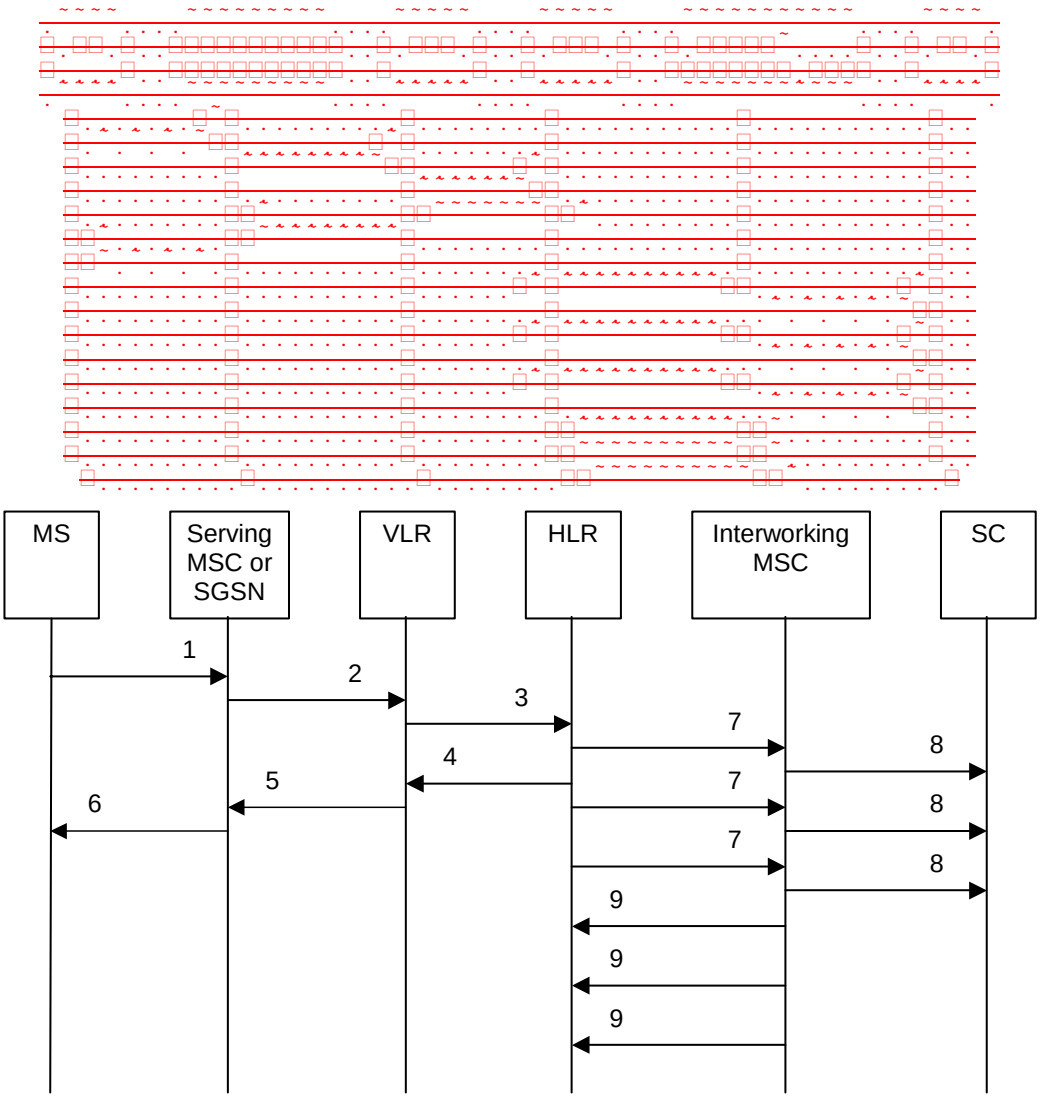
1) CM Service Request (**), Page response or Location Updating (3GPP TS 24.008 [35]).
2) MAP_PROCESS_ACCESS_REQUEST / MAP_UPDATE_LOCATION_AREA (**).
3) MAP_READY_FOR_SM (Mobile Present) / MAP_UPDATE_LOCATION / Supplementary Service Control Request (*).
4) MAP_READY_FOR_SM_ACK (*).
5) MAP_ALERT_SERVICE_CENTRE (notes 1 and 2).
6) Alert Service Centre (3GPP TS 23.140).
7) MAP_ALERT_SERVICE_CENTRE_ACK.

NOTE 1: To all Service Centres in the Message Waiting List.
NOTE 2: The HLR initiates the MAP_ALERT_SERVICE_CENTRE service only if the MS Memory Capacity Exceeded flag is clear.

(*) ~~In case of~~For GPRS, messages 3) and 4) are sent/received by the SGSN.
(**) Those messages are not used by the SGSN.

Figure 23.4/1: Short message alert procedure (Mobile is present)

The message flow for the Short Message Alert procedure for the case where the MS indicates that it has memory capacity to accept one or more short messages is shown in figure 23.4/2.



1) SM memory capacity available (3GPP TS 24.011 [37]).
2) MAP_READY_FOR_SM (Memory Available) (*).
3) MAP_READY_FOR_SM (Memory Available) (**).
4) MAP_READY_FOR_SM_ACK (**).
5) MAP_READY_FOR_SM_ACK (*).
6) SM memory capacity available (Acknowledge) (3GPP TS 24.011 [37]).
7) MAP_ALERT_SERVICE_CENTRE (note).
8) Alert Service Centre (3GPP TS 23.140).
9) MAP_ALERT_SERVICE_CENTRE_ACK.

NOTE: To all Service Centres in the Message Waiting List.
(*) Message 2) and 5) are not used by the SGSN.
(**) ~~In the case of~~For GPRS, messages 3) and 4) are sent/received by the SGSN.

Figure 23.4/2: Short message alert procedure (MS memory capacity available)

In addition the following MAP services are used in the MS memory available case:

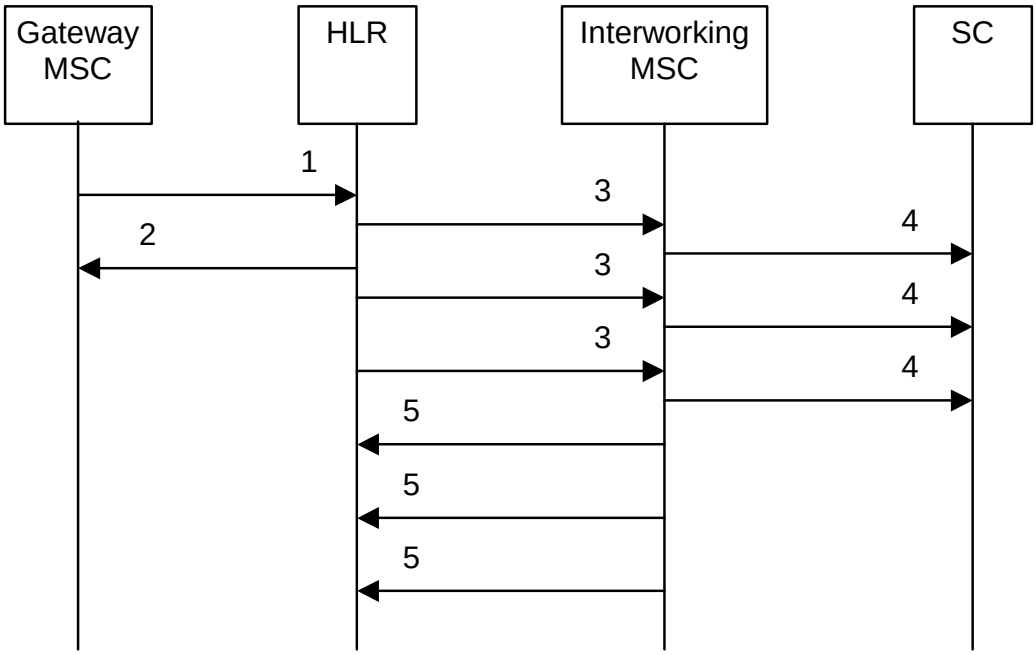
MAP_PROCESS_ACCESS_REQUEST	(see subclause 8.3); (*)
MAP_AUTHENTICATE	(see subclause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see subclause 8.6); (*)
MAP_PROVIDE_IMSI	(see subclause 8.9); (*)
MAP_CHECK_IMEI	(see subclause 8.7);

MAP_FORWARD_NEW_TMSI (see subclause 8.9); (*)

MAP_TRACE_SUBSCRIBER_ACTIVITY (see subclause 9.1). (*)

(*) Those messages are not used by the SGSN.

The Short Message Alert procedure when the MS indicates successful transfer after polling is shown in figure 23.4/3.



1) MAP_REPORT_SM_DELIVERY_STATUS (Successful Transfer).
2) MAP_REPORT_SM_DELIVERY_STATUS_ACK.
3) MAP_ALERT_SERVICE_CENTRE (note).
4) Alert Service Centre (3GPP TS 23.140).
5) MAP_ALERT_SERVICE_CENTRE_ACK.

NOTE: To all Service Centres in the Message Waiting List.

Figure 23.4/3: Short message alert procedure (Successful transfer after polling)

23.4.1 Procedures in the Servicing MSC – the MS has memory available

~~The activation of the MAP_PROCESS_ACCESS_REQUEST service is described in the clause 23.6.2.~~

~~After~~ When the MSC receives~~ing the~~ an SM memory capacity available indication, ~~the servicing MSC~~it sends to the VLR ~~the~~ a MAP_READY_FOR_SM request ~~to the VLR~~ indicating that the MS has memory available, and waits for a response. ~~The outcome of that procedure is one of the following~~While the MSC is waiting for the response from the VLR:

- if the MSC receives a Release indication from the A-interface, it aborts the dialogue with the VLR, and the process terminates;

- if the VLR aborts, or prematurely closes, the dialogue, the MSC sends an A_RP_ERROR with error cause "Network out of order" to the MS, and the process terminates;

- if the ~~VLR~~MSC receives a MAP_READY_FOR_SM confirmation from the VLR, it checks the confirmation.

  - if the confirmation includes an error, the MSC sends an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;

  - if the confirmation indicates a successful outcome, the MSC sends an RP_ACK to the MS, and the process terminates.

~~successful acknowledgement. The MSC sends the corresponding message to the MS;~~

~~negative acknowledgement, where the error causes are treated as follows:~~

~~unexpected data value, data missing and system failure errors are reported as network out of order error to the MS;~~

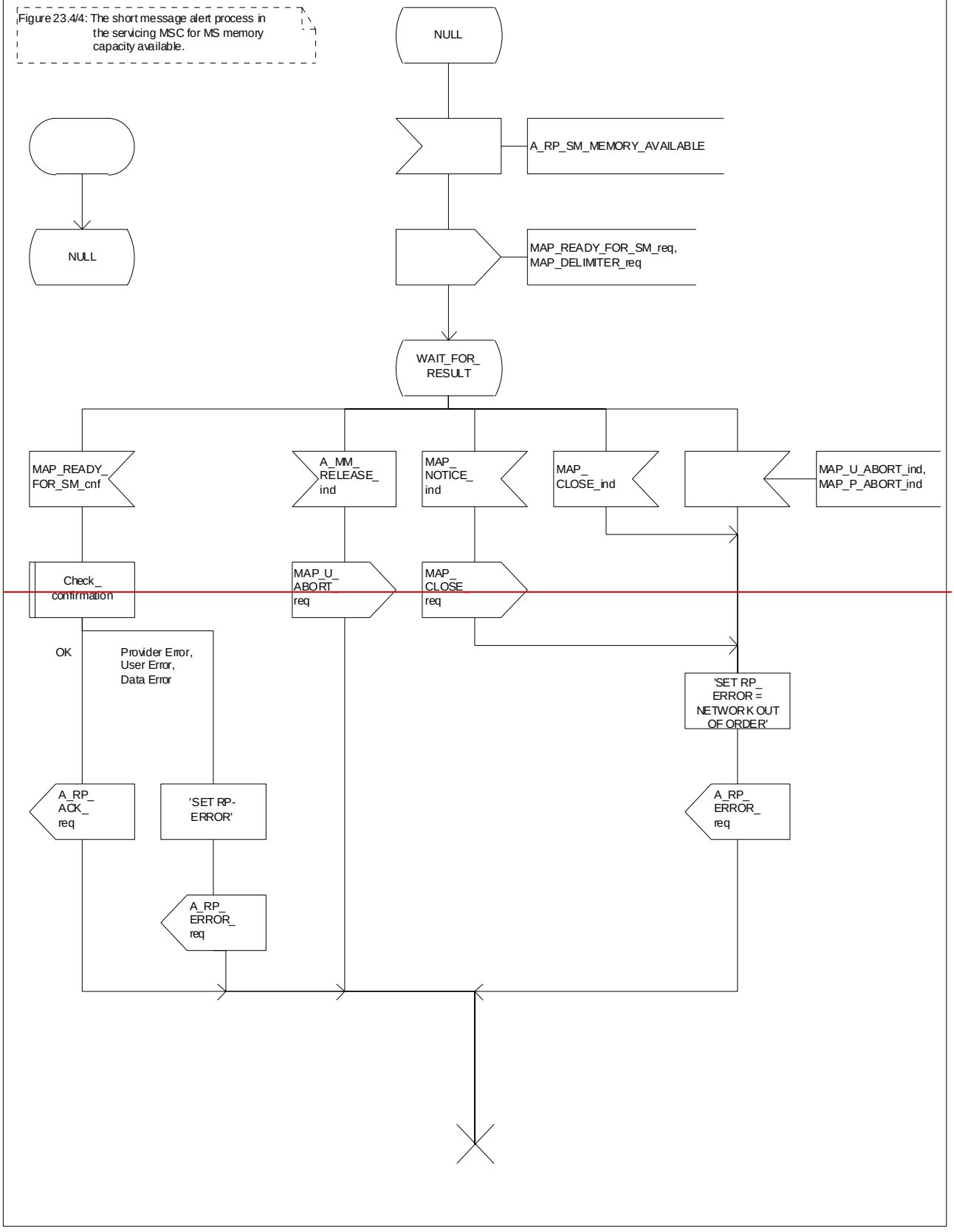
~~facility not supported is reported as requested facility not implemented error to the MS;~~

~~procedure failure, which is reported as network out of order error to the MS if a connection to the MS still exists.~~

The short message alert proces~~sdure~~ in the MSC for the MS memory capacity available case is shown in figure 23.4/4.

Process SM_Alert_MSC 23.4_4(1)

Figure 23.4/4: The short message alert process in the servicing MSC for MS memory capacity available.



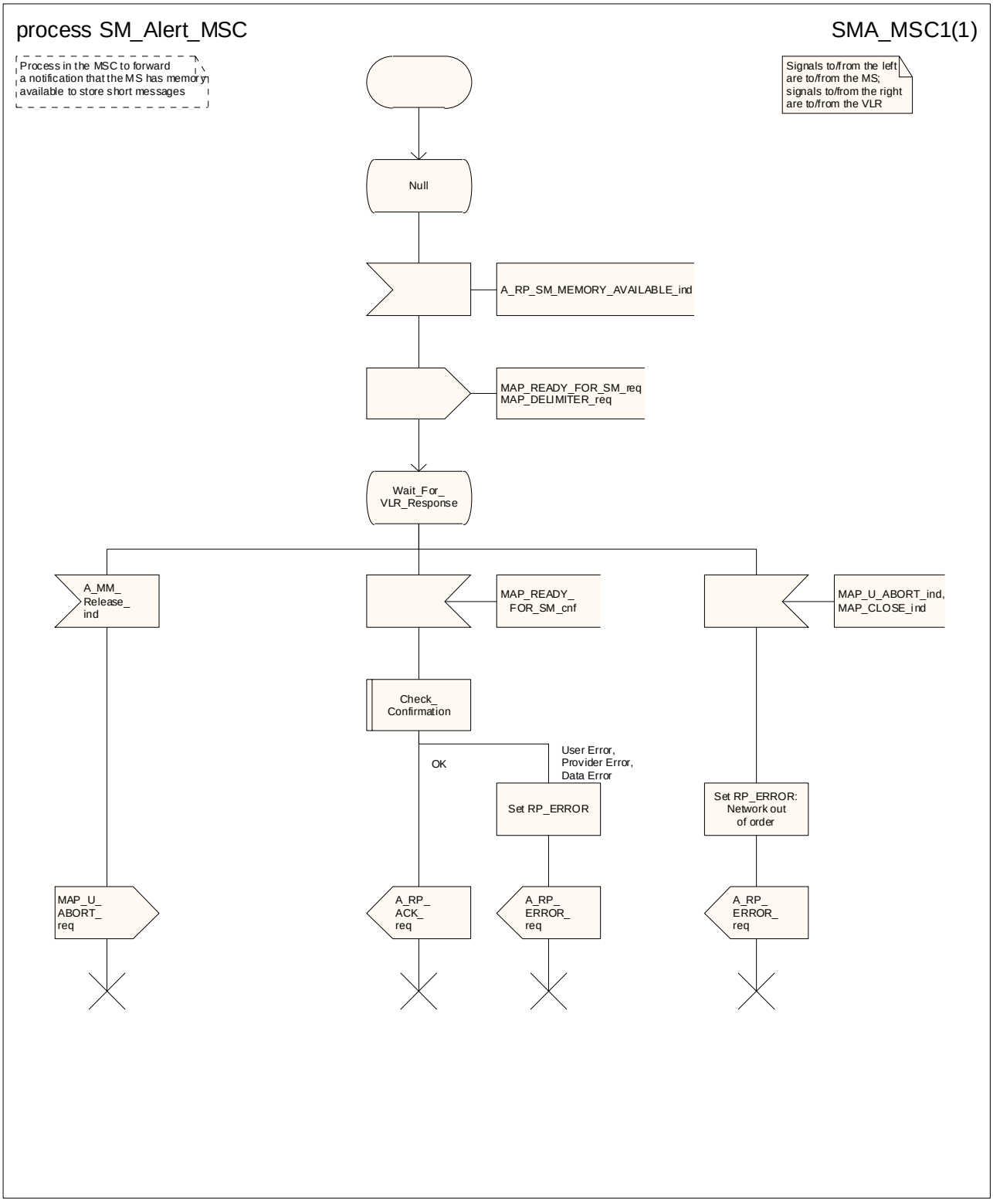


Figure 23.4/4: Procedure SM_Alert_MSC

23.4.2 Procedures in the VLR

23.4.2.1 The Mobile Subscriber is present

~~When receiving the~~If the VLR successfully handles a MAP_PROCESS_ACCESS_REQUEST indication~~,~~ or a MAP_UPDATE_LOCATION_AREA indication while the MS ~~n~~Not ~~r~~Reachable ~~f~~Flag (MNRF) is set, the VLR ~~will~~ send~~s~~ a ~~the~~ MAP_READY_FOR_SM request to~~wards~~ the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for non GPRS. If ~~the~~ authentication ~~procedure is initiated and it~~ fails during the handling of a MAP_PROCESS_ACCESS_REQUEST indication or a MAP_UPDATE_LOCATION_AREA indication, the VLR ~~will~~ shall not send a MAP_READY_FOR_SM request to the HLR~~initiate the service~~. The process in the VLR is described in detail in ~~the~~ subclause 25.10.

23.4.2.2 The ~~Mobile Equipment~~MS has memory available

The process is triggered by a dialogue opening request followed by a MAP_PROCESS_ACCESS_REQUEST indication including a CM service type Short Message Service.

~~starts the MAP_PROCESS_ACCESS_REQUEST service in the VLR. The application context in the MAP_OPEN indication refers to the short message alerting procedure.~~

- ~~I~~if the macro Process_Access_Request_VLR takes the "Error" exit, the process returns to the Null state.~~service MAP_PROCESS_ACCESS_REQUEST is successful, the VLR waits for the next message from the MSC. When receiving the MAP_READY_FOR_SM indication from the MSC, the VLR will check the contents. Data errors are reported to the MSC as an unexpected data value or data missing error, depending on the error. If the primitive passes the data check, the VLR forwards it to the HLR and awaits an acknowledgement.~~

- if the macro Process_Access_Request_VLR takes the "OK" exit, the VLR waits for a MAP_READY_FOR_SM indication from the MSC.

When the VLR receives a MAP_READY_FOR_SM indication from the MSC, it checks the indication.

- if the indication is badly formed, the VLR returns a MAP_READY_FOR_SM response containing the appropriate User Error;

- if the indication is OK, the VLR requests a dialogue with the HLR, including a MAP_READY_FOR_SM request with Ready for SM reason Memory available for non-GPRS, and waits for the confirmation of the dialogue.

  - if the macro Receive_Open_Cnf takes the "Error" exit, the VLR returns a MAP_READY_FOR_SM response containing a User Error "System failure", and the process returns to the Null state;

  - if the macro Receive_Open_Cnf takes the "V1" exit, the VLR returns a MAP_READY_FOR_SM response containing a User Error "Facility not supported", and the process returns to the Null state;

  - if the macro Receive_Open_Cnf takes the "Vr" (for a version higher than 1) exit, the VLR handles the dialogue according to the specification for the earlier version of the protocol, and the process returns to the Null state;

  - if the macro Receive_Open_Cnf takes the "OK" exit, the VLR waits for a response from the HLR.

When the VLR is waiting for a response from the HLR:

- if the dialogue with the HLR fails, the VLR returns a MAP_READY_FOR_SM response containing a User Error "System failure", and the process returns to the Null state;

- if it receives a MAP_READY_FOR_SM confirmation, it checks the confirmation.

  - if the confirmation contains an error, the VLR returns a MAP_READY_FOR_SM response containing the appropriate User Error , and the process returns to the Null state;

  - if the confirmation indicates success, the VLR returns a MAP_READY_FOR_SM response indicating success, and the process returns to the Null state.

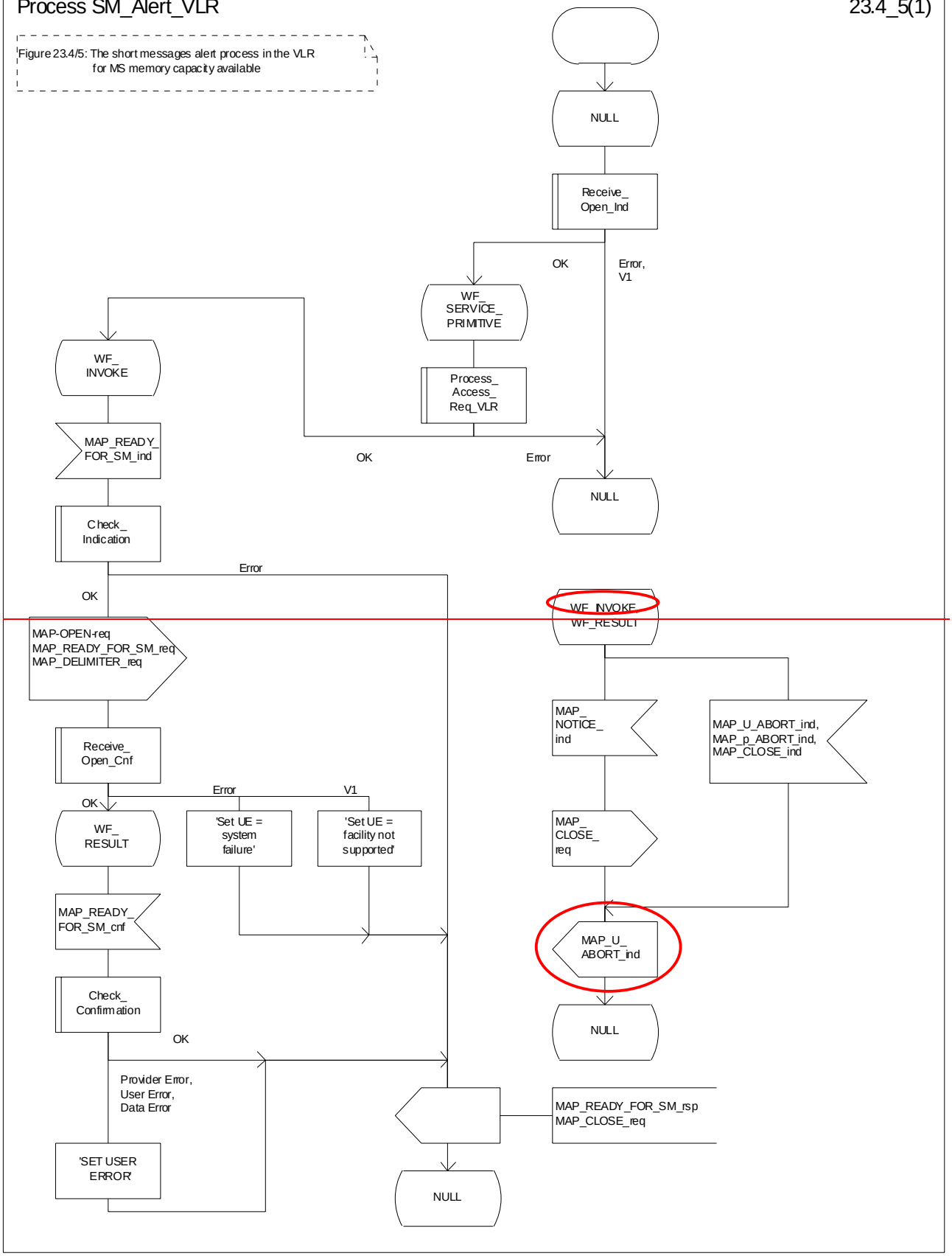
~~When receiving the MAP_READY_FOR_SM confirmation from the HLR and the Alert Reason is MS memory available, the VLR will act as follows:~~

- ~~the MAP_READY_FOR_SM response is sent to the MSC as follows:~~
  - ~~an acknowledgement in the positive case;~~
  - ~~system failure error, if unexpected data value, data missing, or unknown subscriber errors are received, otherwise the error cause received from the HLR;~~
  - ~~a facility not supported error, if the HLR supports MAP Vr only;~~
  - ~~procedure failure is reported as a system failure error.~~

The short message alert proces[s]~~dure~~ in the VLR is shown in figure~~s~~ 23.4/5.

Process SM_Alert_VLR 23.4_5(1)

Figure 23.4/5: The short messages alert process in the VLR for MS memory capacity available



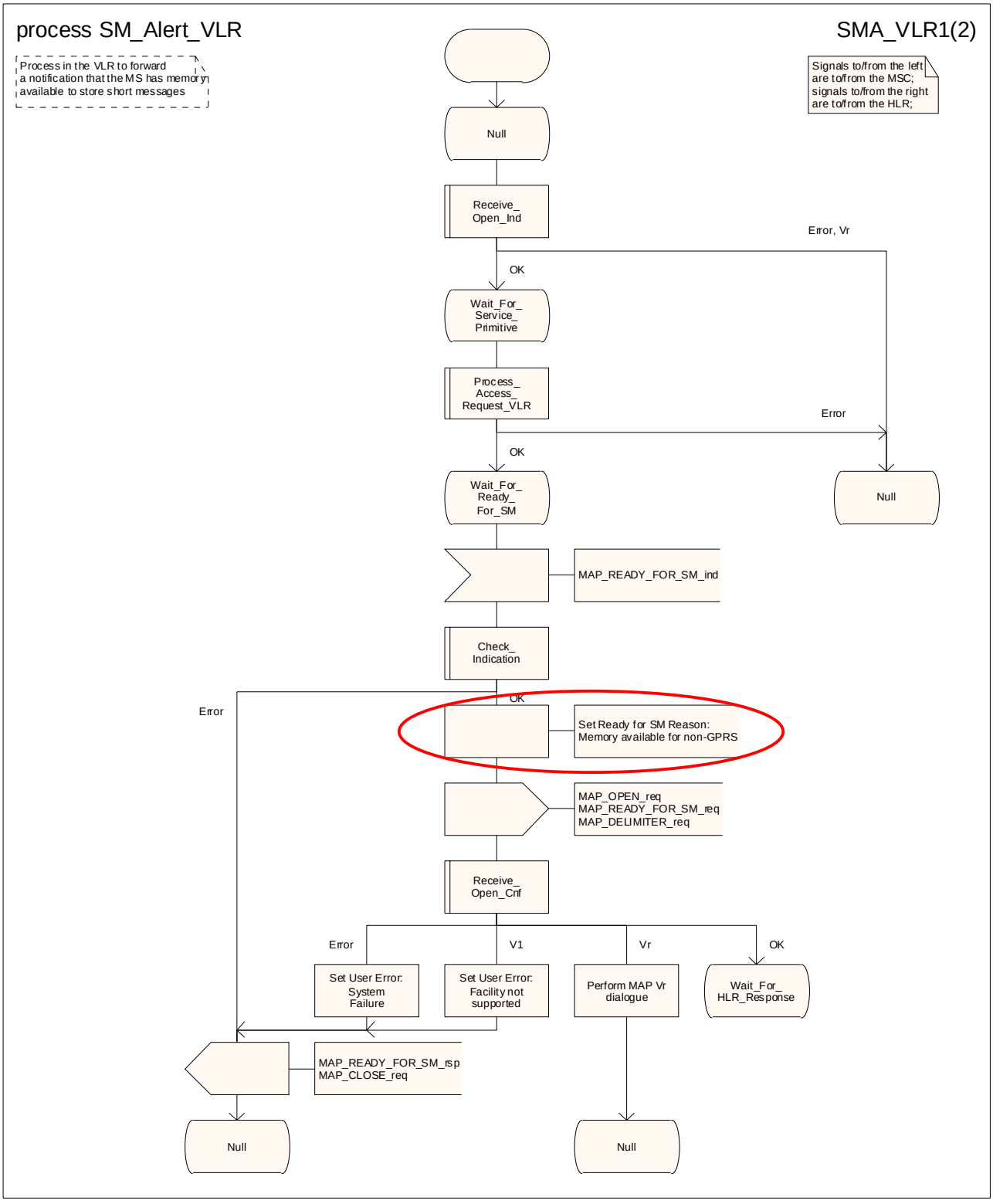


Figure 23.4/5 (sheet 1 of 2): Procedure SM_Alert_VLR

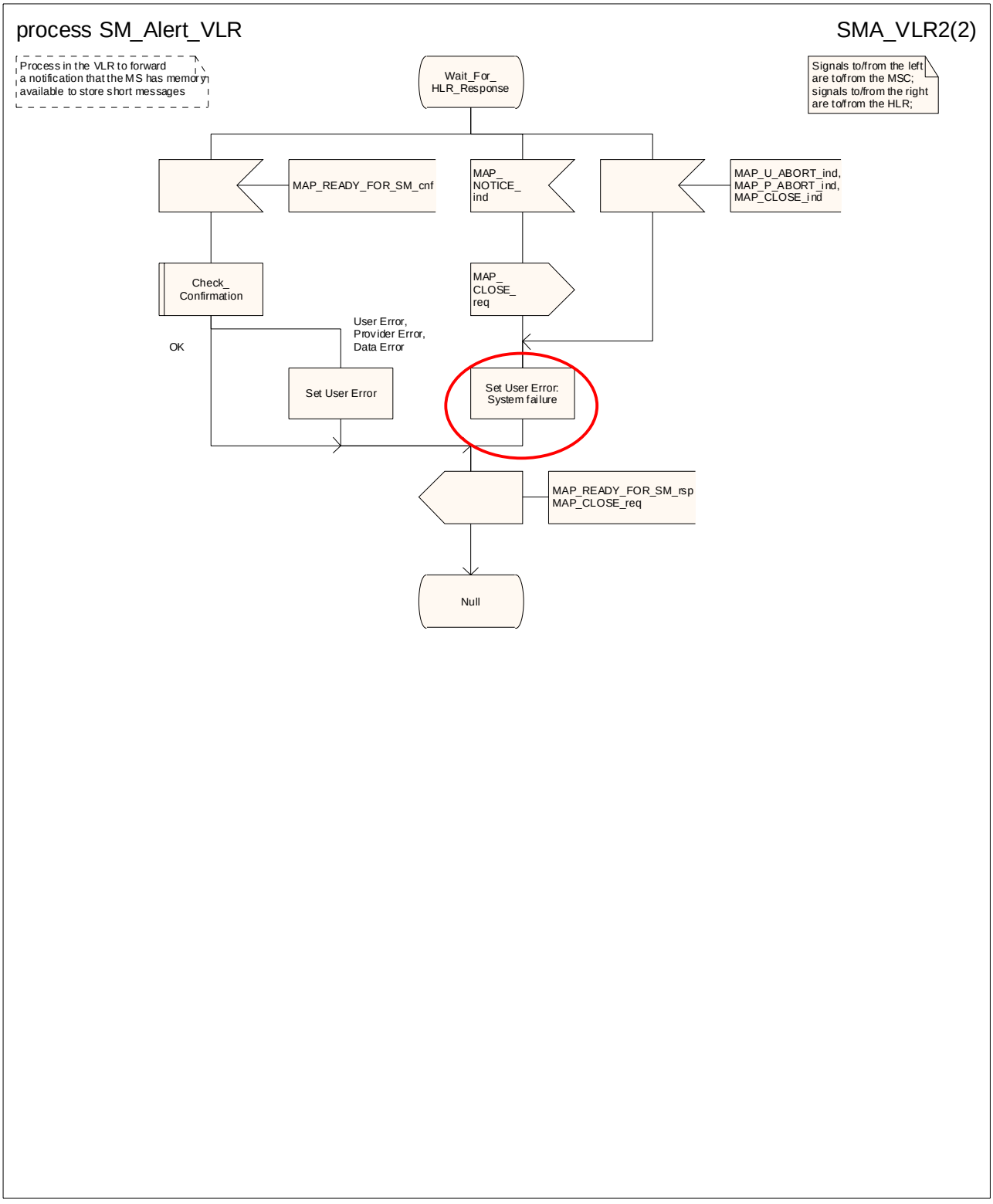


Figure 23.4/5 (sheet 2 of 2): Procedure SM_Alert_VLR

23.4.3 Procedures in the HLR

The process is triggered by a dialogue opening request using the application context mwdMngtContext.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the HLR handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

NOTE: if the dialogue opening request is from an SGSN, version 2 and version 1 of the application context are not applicable.

- if the macro Receive_Open_Ind takes the "OK" exit, the HLR waits for a service primitive.

While the HLR is waiting for the service primitive:

- if the dialogue fails, the process returns to the Null state;
- if it receives a MAP_READY_FOR_SM indication, it checks the indication.
  - if the indication is badly formed, the HLR returns a MAP_READY_FOR_SM response containing the appropriate user error, and the process returns to the Null state;
  - if the indication is OK, the HLR checks whether it supports:
    - one or both of MNRF and MNRG, and
    - MCEF and
    - MWD.
      - if the HLR does not support the message waiting features listed, it returns a MAP_READY_FOR_SM response containing the user error "Facility not supported", and the process returns to the Null state;
      - if the HLR supports the message waiting features listed, but the subscriber is not known, it returns a MAP_READY_FOR_SM response containing the user error "Unknown subscriber", and the process returns to the Null state;
      - if the subscriber is known, the HLR returns a MAP_READY_FOR_SM response indicating a successful result, and checks whether one or more of MNRF, MNRG and MCEF is set.
        - if none of MNRF, MNRG and MCEF is set, the HLR starts a race timer and waits for a possible delivery failure report. This allows for the race condition where a delivery failure report is delayed in the path through the SMS-GMSC, and is overtaken by a subsequent "ready for SM" condition reported by the serving node to the HLR;
        - if one or more of MNRF, MNRG and MCEF is set, the HLR continues by handling the alerting process as described below under the heading "Alerting the Service Centre(s)".
- if it receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it invokes the macro Report_SM_Delivery_Stat_HLR.
  - if the macro takes the "Error" exit, the HLR waits for a possible MAP_READY_FOR_SM indication;
  - if the macro takes the "OK" exit, the HLR checks whether the delivery was successful.
    - if the delivery was unsuccessful, the HLR waits for a possible MAP_READY_FOR_SM indication;
    - if the delivery was successful, the HLR stops the Race timer, and the process returns to the Null state.

When the HLR is waiting for a possible MAP_READY_FOR_SM indication or MAP_REPORT_SM_DELIVERY_STATUS indication with the race timer running:

- if the race timer expires, the process returns to the Null state;
- if the HLR receives a dialogue opening request, it invokes the macro Receive_Open_Ind.

- if the macro takes the "Error" exit, the process returns to the Null state;
- if the macro takes the "Vr" exit, the HLR handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the HLR waits for a service primitive.

Alerting the Service Centre(s)

The HLR checks the Ready for SM reason which was received from the serving node.

- if the reason was "Memory available for GPRS", the HLR clears the MNRG flag and the MCEF and invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
- if the reason was "Subscriber present for GPRS", the HLR clears the MNRG flag and checks the MCEF.
  - if the MCEF is not set, the HLR invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
  - if the MCEF is set, the process returns to the Null state;
- if the reason was "Memory available for non-GPRS", the HLR clears the MNRF and the MCEF and invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
- if the reason was "Subscriber present for non-GPRS", the HLR clears the MNRF and checks the MCEF.
  - if the MCEF is not set, the HLR invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
  - if the MCEF is set, the process returns to the Null state.

~~When receiving the MAP_READY_FOR_SM indication, the HLR will check the contents. Data errors are reported to the VLR as an unexpected data value or a data missing error depending on the error. If the HLR does not support the MNRF or MNRG, MCEF, and MWD a facility not supported error is reported to the VLR or SGSN. If the IMSI is unknown an unknown subscriber error is reported to the VLR or SGSN. Otherwise an acknowledgement is returned to the VLR or SGSN.~~

~~If neither the MS not reachable flag (MNRF) or the MS not reachable for GPRS (MNRG) flag, nor the memory capacity exceeded flag (MCEF) are set, and MAP_READY_FOR_SM is received from the VLR or SGSN, the HLR sets a timer and waits for it to expire. This ensures that in the race situation the MAP_REPORT_SM_DELIVERY_STATUS service (as described in the clause 23.6) for the same subscriber can be carried out when delayed in the GMSC.~~

~~If the Alert Reason indicates the mobile present for non GPRS situation, or when the update location procedure has been successfully completed or Supplementary Service Control request is received, the MS not reachable flag (MNRF) is cleared and the service centre alert procedure is initiated. If the memory capacity exceeded flag is set, the MS not reachable flag is cleared and stored reason for absence for non GPRS are cleared but the alert procedure is not started.~~

~~If the Alert Reason indicates the mobile present for GPRS situation, or when the Update GPRS location procedure has been successfully completed, the MS not reachable for GPRS (MNRG) flag is cleared and the service centre alert procedure is initiated. If the memory capacity exceeded flag is set, the MS detach for GPRS flag is cleared and stored reason for absence for GPRS are cleared but the alert procedure is not started.~~

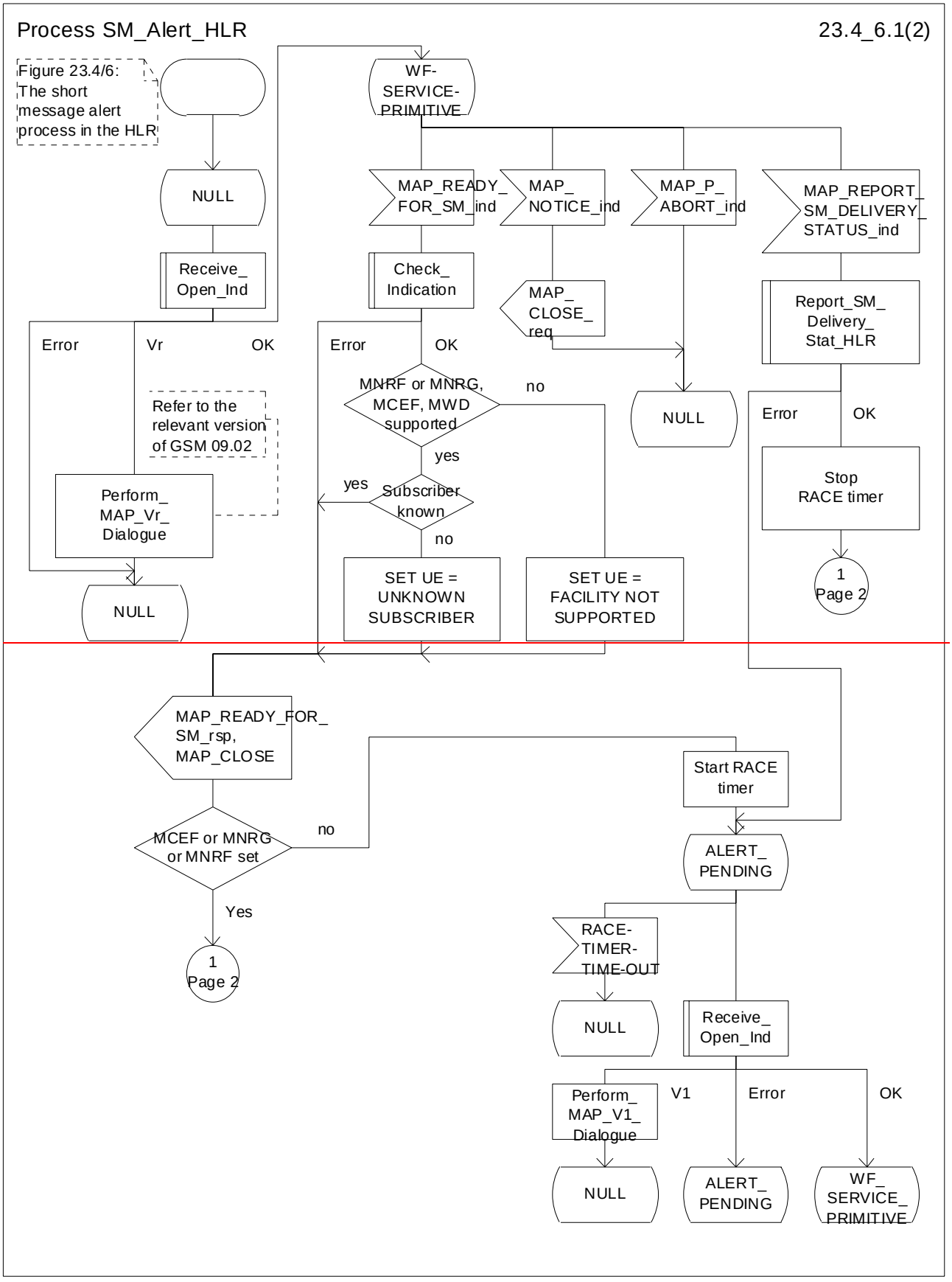
~~If the Alert Reason indicates the memory available for non GPRS situation, the HLR initiates the alert procedure. The MS not reachable and memory capacity available flags are cleared.~~

~~If the Alert Reason indicates the memory available for GPRS situation, the HLR initiates the alert procedure. The MS detach for GPRS and memory capacity available flags are cleared.~~

~~If the MAP_REPORT_SM_DELIVERY_STATUS indication is received and it indicates the successful transfer of the mobile terminated short message for non GPRS, the HLR initiates the alert procedure described in the clause 25.10 and clears MCEF and MNRF flags and stored reason for absence for non GPRS are cleared.~~

~~If the MAP_REPORT_SM_DELIVERY_STATUS indication is received and it indicates the successful transfer of the mobile terminated short message for GPRS, the HLR initiates the alert procedure described in the clause 25.10 and clears MCEF and MNRG flags and stored reason for absence for GPRS are cleared.~~

The short message alert processdure in the HLR is shown in figures 23.4/6 and 25.10/2.


Process SM_Alert_HLR
23.4_6.1(2)
Figure 23.4/6: The short message alert process in the HLR
NULL
Receive_ Open_Ind
Error
Vr
OK
Refer to the relevant version of GSM 09.02
Perform_ MAP_Vr_ Dialogue
NULL
WF- SERVICE- PRIMITIVE
MAP_READY_ FOR_SM_ind
MAP_ NOTICE_ind
MAP_P_ ABORT_ind
MAP_REPORT_ SM_DELIVERY_ STATUS_ind
Check_ Indication
MAP_ CLOSE_ req
Error
OK
MNRF or MNRG, MCEF, MWD supported
no
yes
yes
Subscriber known
no
SET UE = UNKNOWN SUBSCRIBER
SET UE = FACILITY NOT SUPPORTED
NULL
Report_SM_ Delivery_ Stat_HLR
Error
OK
Stop RACE timer
1 Page 2
MAP_READY_FOR_ SM_rsp, MAP_CLOSE
MCEF or MNRG or MNRF set
no
Yes
1 Page 2
Start RACE timer
ALERT_ PENDING
RACE- TIMER- TIME-OUT
NULL
Receive_ Open_Ind
Perform_ MAP_V1_ Dialogue
V1
Error
OK
NULL
ALERT_ PENDING
WF_ SERVICE_ PRIMITIVE

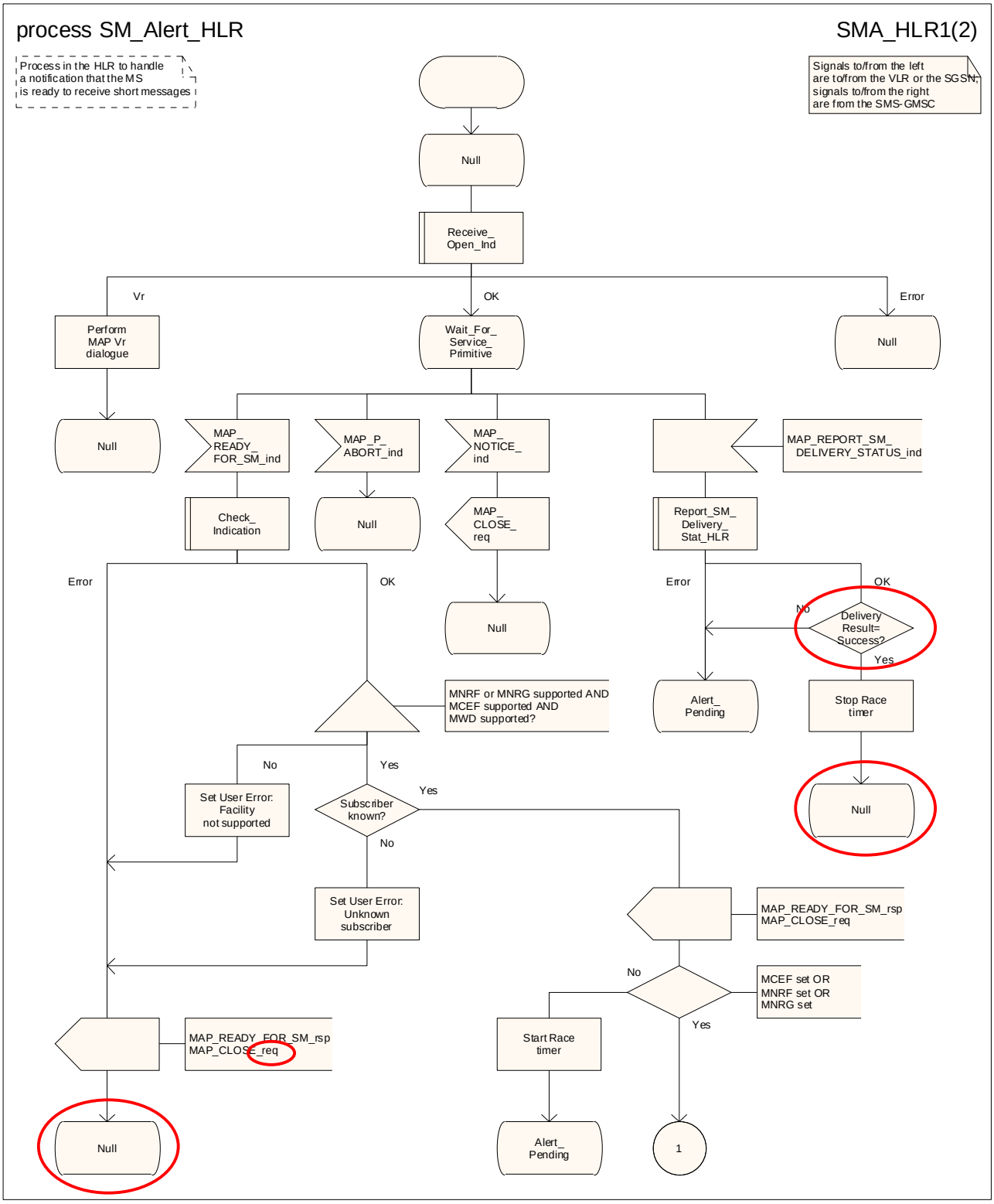
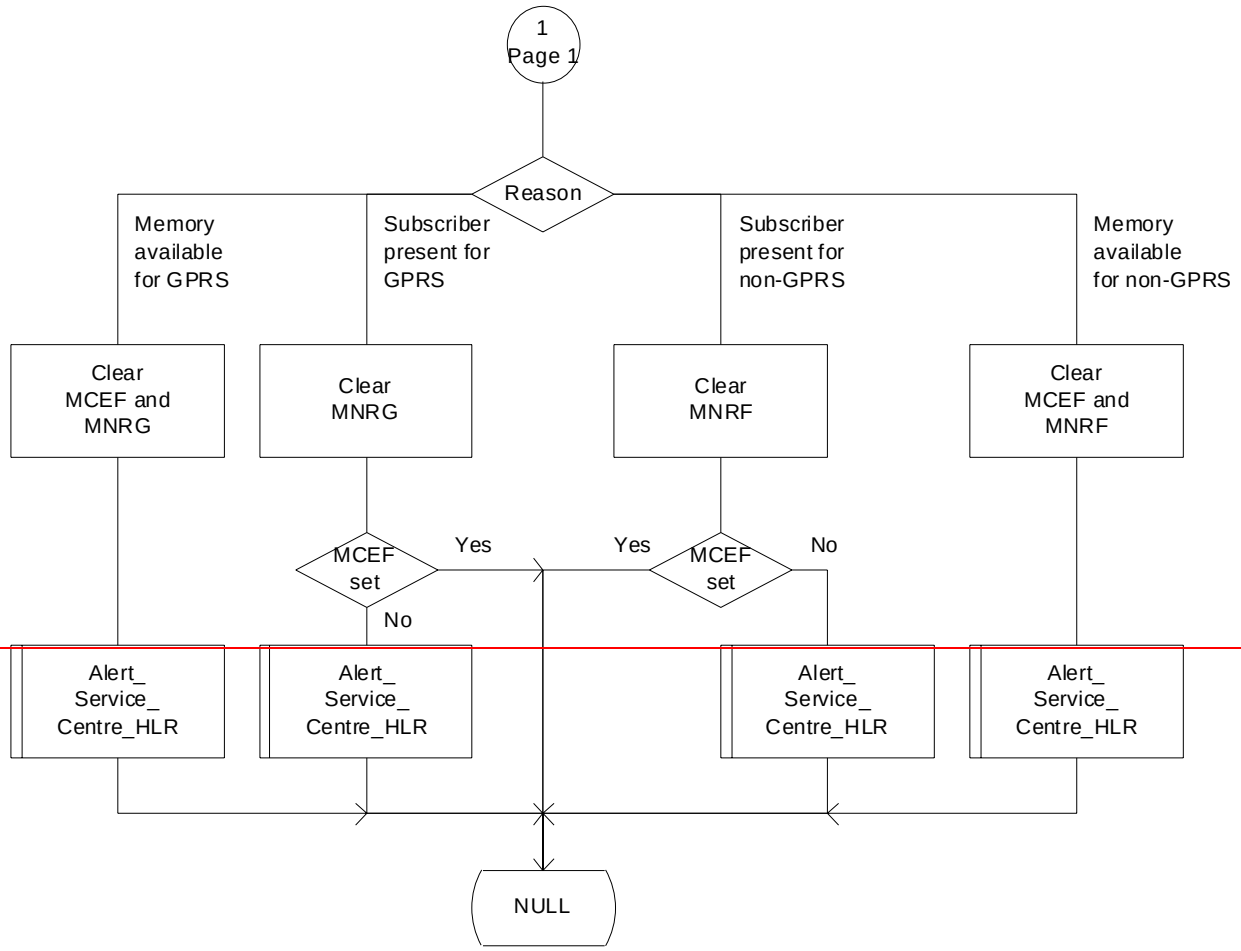


Figure 23.4/6 (sheet 1 of 2): Process SM_Alert_HLR

Process SM_Alert_HLR 23.4_6.2(2)

Figure 23.4/6: The short message alert process in the HLR



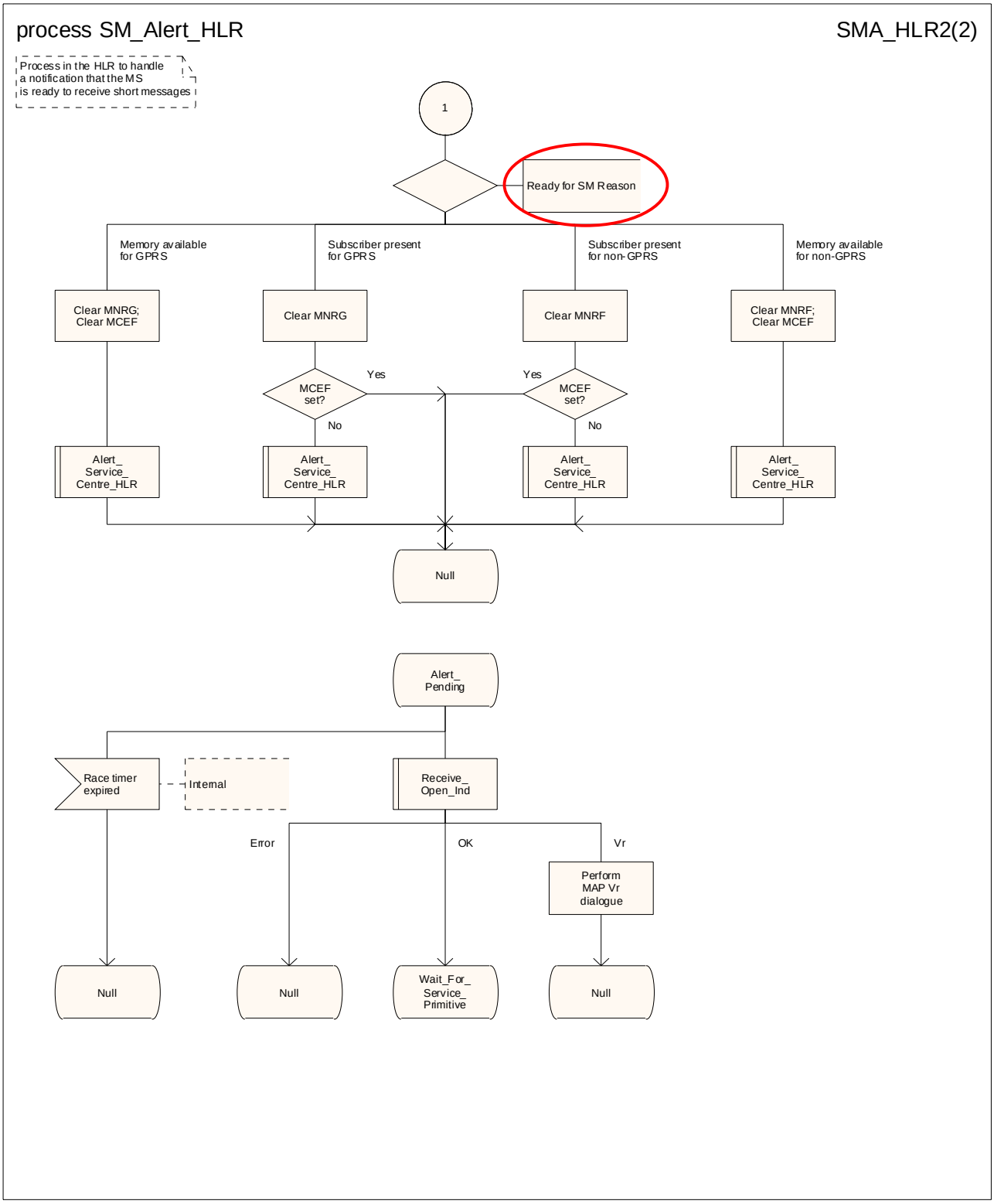


Figure 23.4/6 (sheet 2 of 2): Process SM_Alert_HLR

23.4.4 Procedures in the SMS Interworking MSC

The process is triggered by a dialogue opening request using the application context shortMsgAlertContext.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the SMS-IWMSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the SMS-IWMSC waits for a service primitive.

While the SMS-IWMSC is waiting for the service primitive:

- if the dialogue fails, the process returns to the Null state;
- if it receives a MAP_ALERT_SERVICE_CENTRE indication, it checks the indication.
  - if the indication is badly formed, the SMS-IWMSC returns a MAP_ALERT_SERVICE_CENTRE response containing the appropriate user error, and the process returns to the Null state;
  - if the indication is OK, the SMS-IWMSC sends an SC_RP_ALERT_SC request to the Service Centre and returns a MAP_ALERT_SERVICE_CENTRE response indicating a successful result, and the process returns to the Null state.

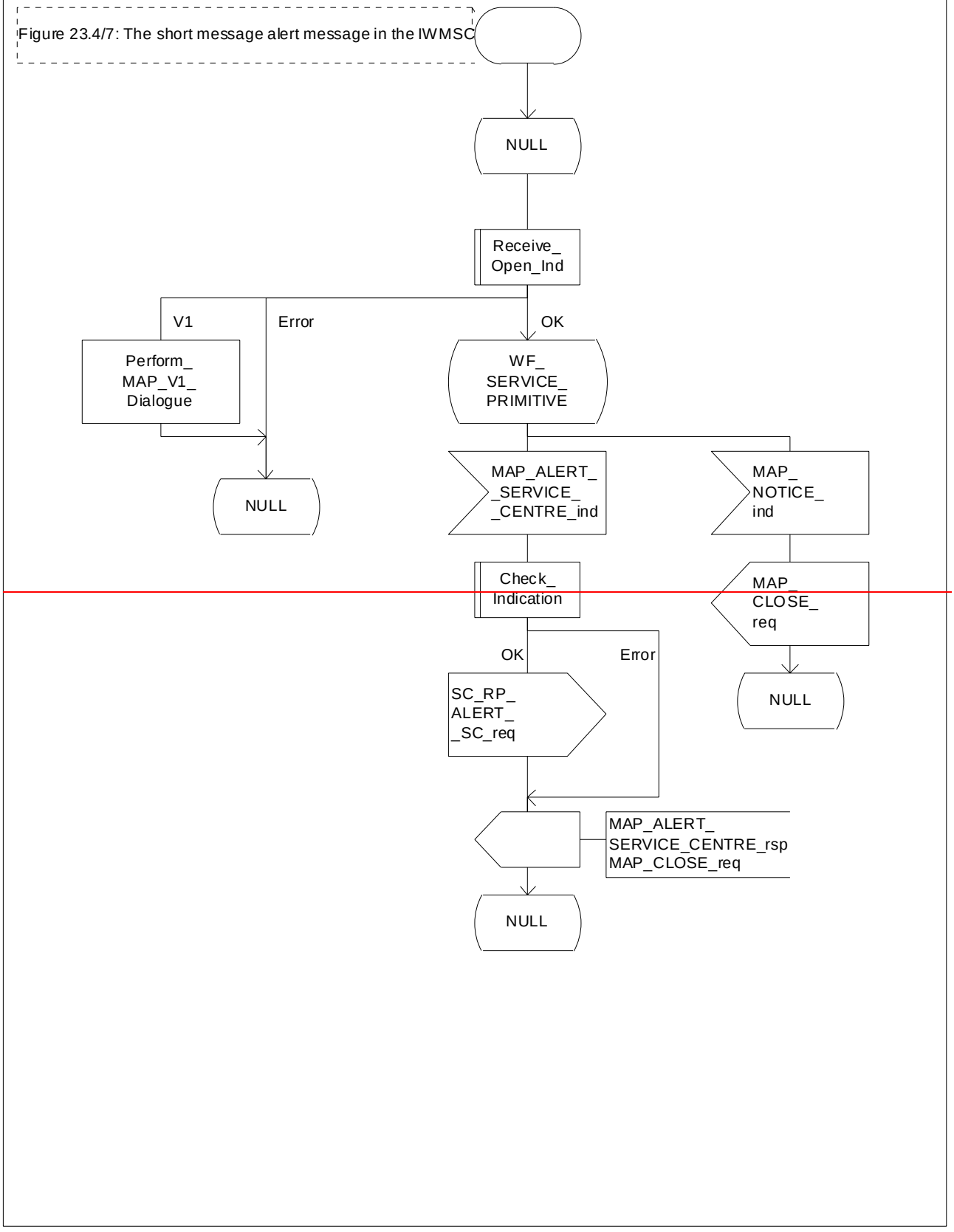
~~When a MAP_ALERT_SERVICE_CENTRE indication is correctly received by the IWMSC, the IWMSC will forward the alerting to the given Service Centre if possible.~~

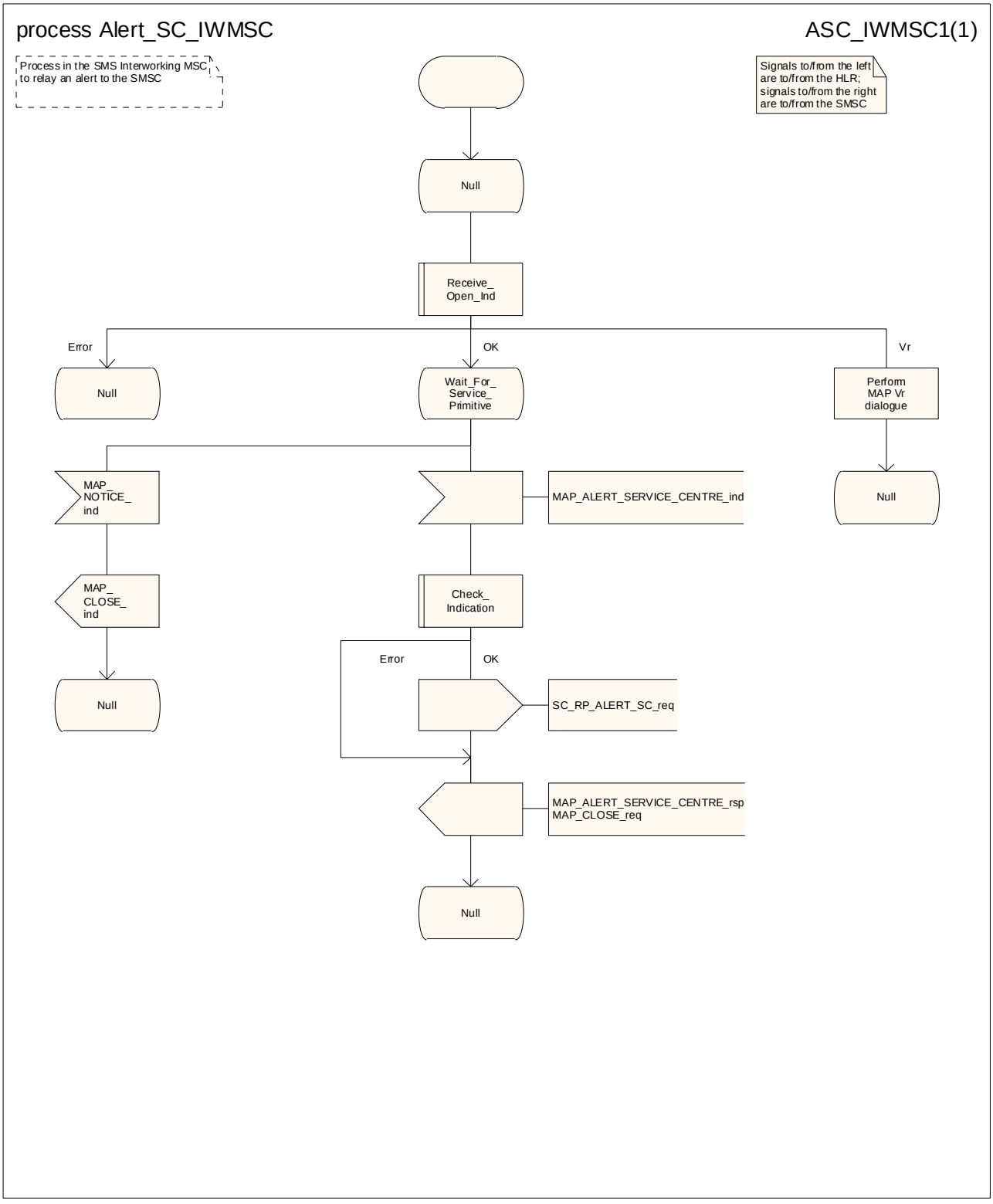
~~Data errors are reported to the HLR as an unexpected data value or a data missing error depending on the error.~~

The short message alert process~~dure~~ in the SMS-IWMSC is shown in figure 23.4/7.

Process Alert_SC_IWMSC 23.4_7(1)

Figure 23.4/7: The short message alert message in the IWMSC





CR editor's note: there is no technical difference; the SDL just looks tidier!

Figure 23.4/7: Process Alert_SC_IWMSC

23.4.5 Procedures in the ~~Servicing~~ SGSN

23.4.5.1 The Mobile Subscriber is present

If the SGSN successfully handles a ~~When receiving~~ Page response, Attach request or Routing ~~a~~Area ~~u~~Update request message~~s~~ (3GPP TS 24.008 [35]), while the MS ~~n~~Not ~~r~~Reachable for GPRS (MNRG) flag is set, the SGSN ~~will~~ sends ~~the~~ a MAP_READY_FOR_SM request to~~wards~~ the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS. If authentication fails during the handling of a Page response, Attach request or Routing Area Update request, the SGSN shall not send a MAP_READY_FOR_SM request to the HLR

~~When receiving the answer, the SGSN will act as follows:~~

- ~~MNRG is cleared if the procedure is successful~~
- ~~MNRG is not cleared if the procedure is not successful~~

The process in the SGSN is described in detail in ~~the~~ subclause 25.10/3.

23.4.5.2 The Mobile Equipment has memory available

The process is triggered by an RP_SM_MEMORY_AVAILABLE indication from the MS.

The SGSN requests a dialogue with the HLR, including a MAP_READY_FOR_SM request with Ready for SM reason Memory available for GPRS, and waits for the confirmation of the dialogue.

- if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN returns an error response containing an RP_ERROR "Network out of order", and the process returns to the Null state;
- if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN returns an error response containing an RP_ERROR "Facility not supported", and the process returns to the Null state;
- if the macro Receive_Open_Cnf takes the "OK" exit, the VLR waits for a response from the HLR.

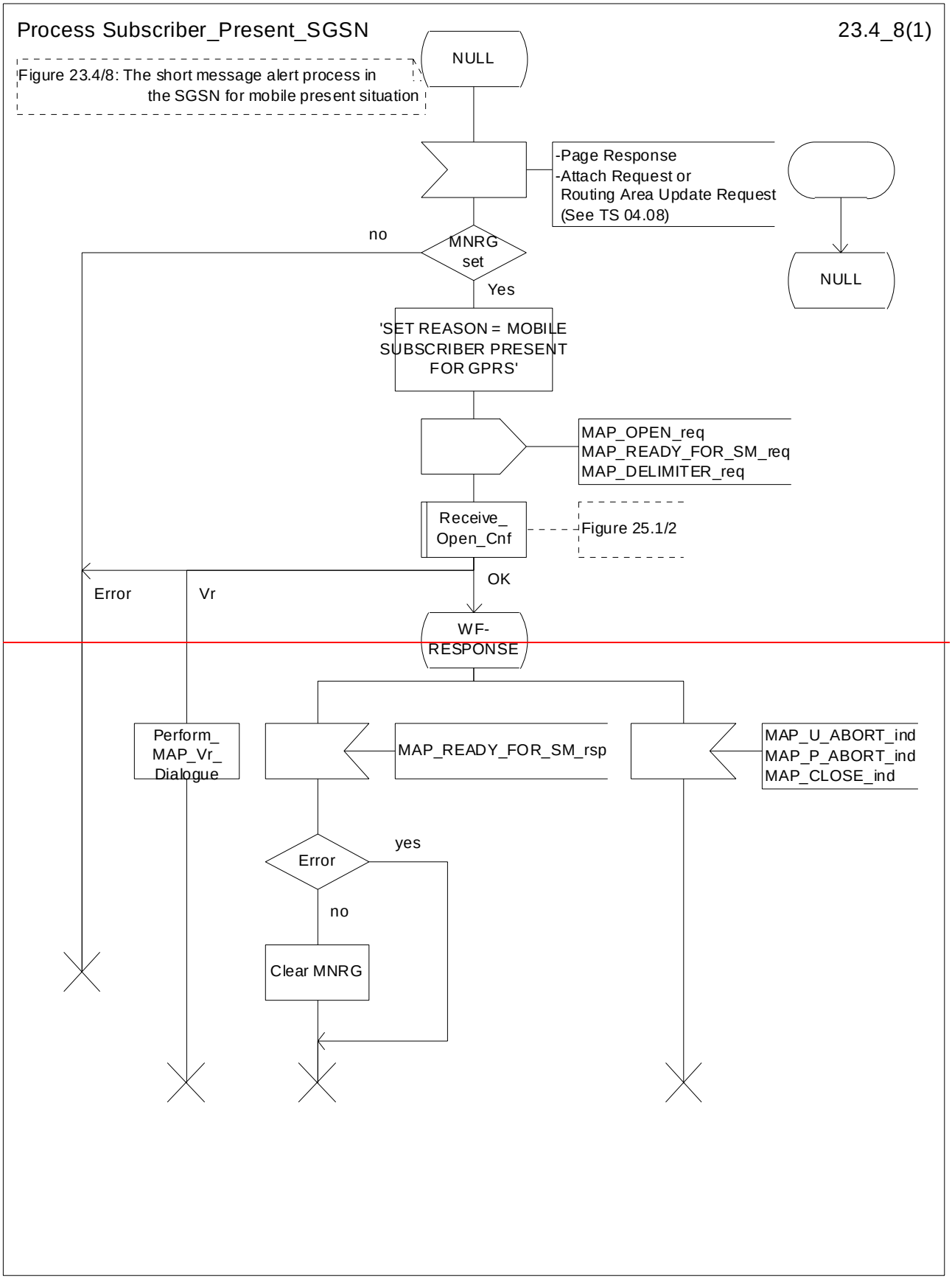
When the SGSN is waiting for a response from the HLR:

- if the dialogue with the HLR fails, the SGSN returns an error response containing an RP_ERROR "Network out of order", and the process returns to the Null state;
- if it receives a Release indication from the Gb interface, it aborts the dialogue with the HLR, and the process returns to the Null state;
- if the SGSN receives a MAP_READY_FOR_SM confirmation, it checks the confirmation.
  - if the confirmation contains an error, the SGSN returns returns an error response containing the appropriate RP_ERROR, and the process returns to the Null state;
  - if the confirmation indicates success, the SGSN returns an RP_ACK, and the process returns to the Null state.

~~After receiving the SM memory capacity available indication, the servicing SGSN sends the MAP_READY_FOR_SM request to the HLR indicating memory available for GPRS. The outcome of that procedure is one of the following:~~

- ~~successful acknowledgement. The SGSN sends the corresponding message to the MS;~~
- ~~negative acknowledgement, where the error causes are treated as follows:~~
  - ~~unexpected data value, data missing and system failure errors are reported as network out of order error to the MS;~~
  - ~~facility not supported is reported as requested facility not implemented error to the MS;~~
- ~~procedure failure, which is reported as network out of order error to the MS if a connection to the MS still exists.~~

The short message alert procedure in the SGSN for the MS memory capacity available case is shown in figure 23.4/8.



CR editor's note: this process is described in clause 25

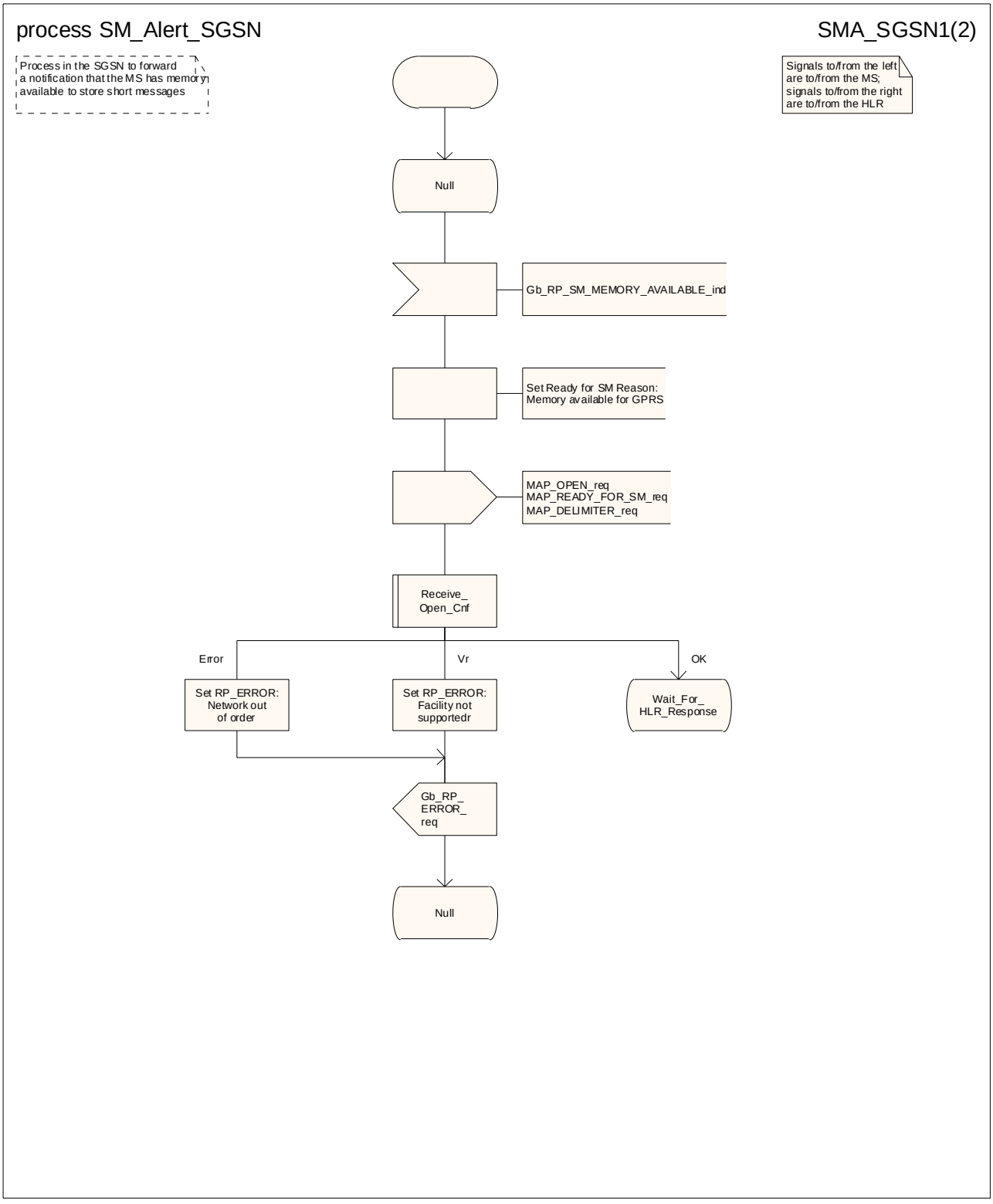


Figure 23.4/8 (sheet 1 of 2): Process ~~Subscriber_Present~~SM_Alert_SGSN

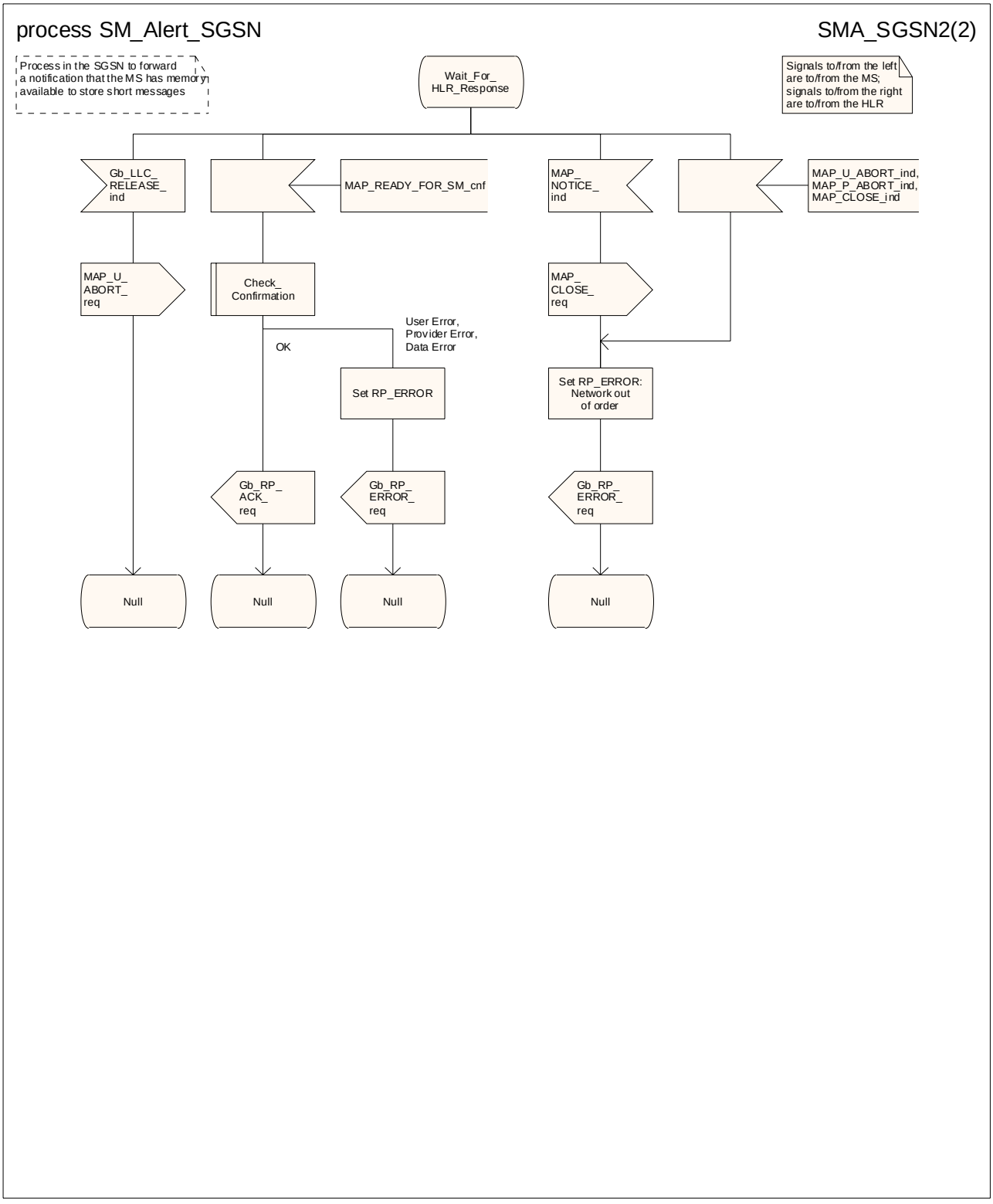


Figure 23.4/8 (sheet 2 of 2): Process SM_Alert_SGSN

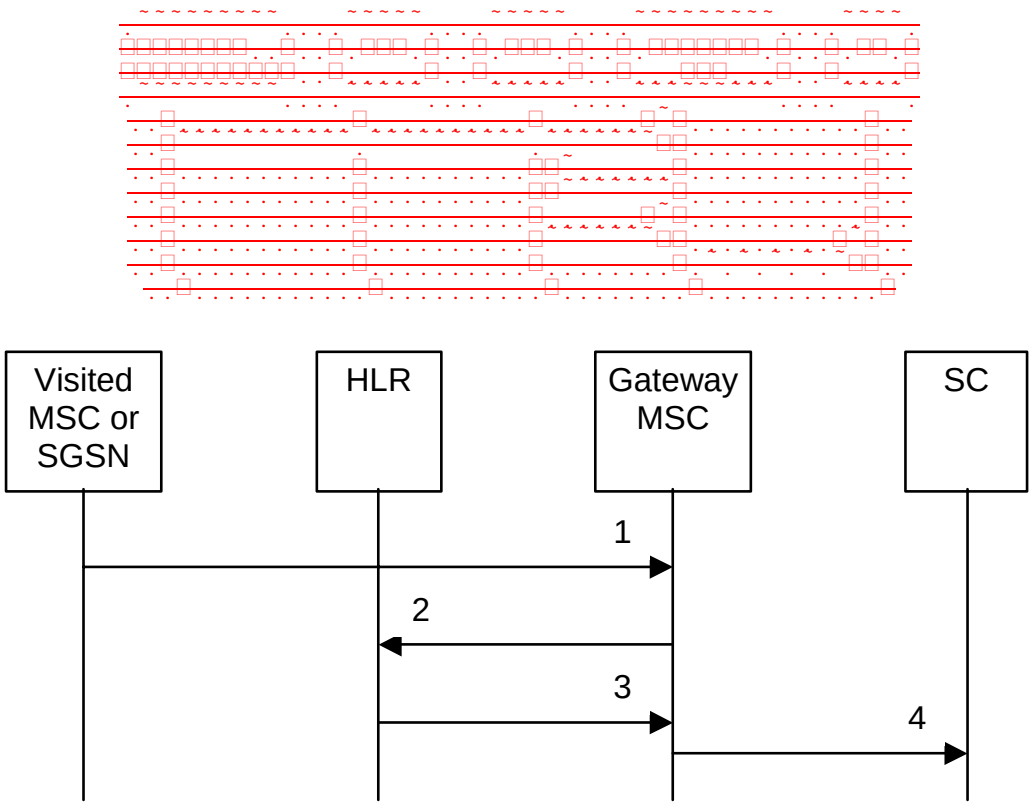
23.5 The SM delivery status report procedure

The SM delivery status report procedure is used:

- to set the Service Centre address into the message waiting list in the HLR after short message delivery has failed because the subscriber is absent or unidentified or the memory capacity is exceeded. The procedure sets:
  - the mMemory cCapacity eExceeded fFlag (MCEF) in the HLR if the MS memory does not have room for more messages;
  - and/or the MS nNot rReachable fFlag for non-GPRS in the case ofif there is no record for the subscriber in the VLR unidentified or absent the subscriber does not respond to paging for delivery via the MSC;
  - and/or the MS nNot rReachable for GPRS (MNRG) flag in the case of unidentified if there is no record for the subscriber in the SGSN or absent the subscriber does not respond to paging for delivery via the SGSN.GPRS

- Additionally the procedure is used to report to the HLR about the successful transfer for GPRS or non GPRS after the Service Centre has polled the subscriberthat delivery has succeeded. This procedure isThe conditions for report of a successful delivery are described also in the subclause 23.3.14.

The message flow for the SM delivery status report procedure is shown in figure 23.5/1.



1) MAP_MT_FORWARD_SHORT_MESSAGE_ACK/_NACK (Absent subscriber_SM, unidentified subscriber or memory capacity exceeded).
2) MAP_REPORT_SM_DELIVERY_STATUS.
3) MAP_REPORT_SM_DELIVERY_STATUS_ACK.
4) Short Message Negative Acknowledgement (3GPP TS 23.140).

Figure 23.5/1: Short message delivery status report procedure

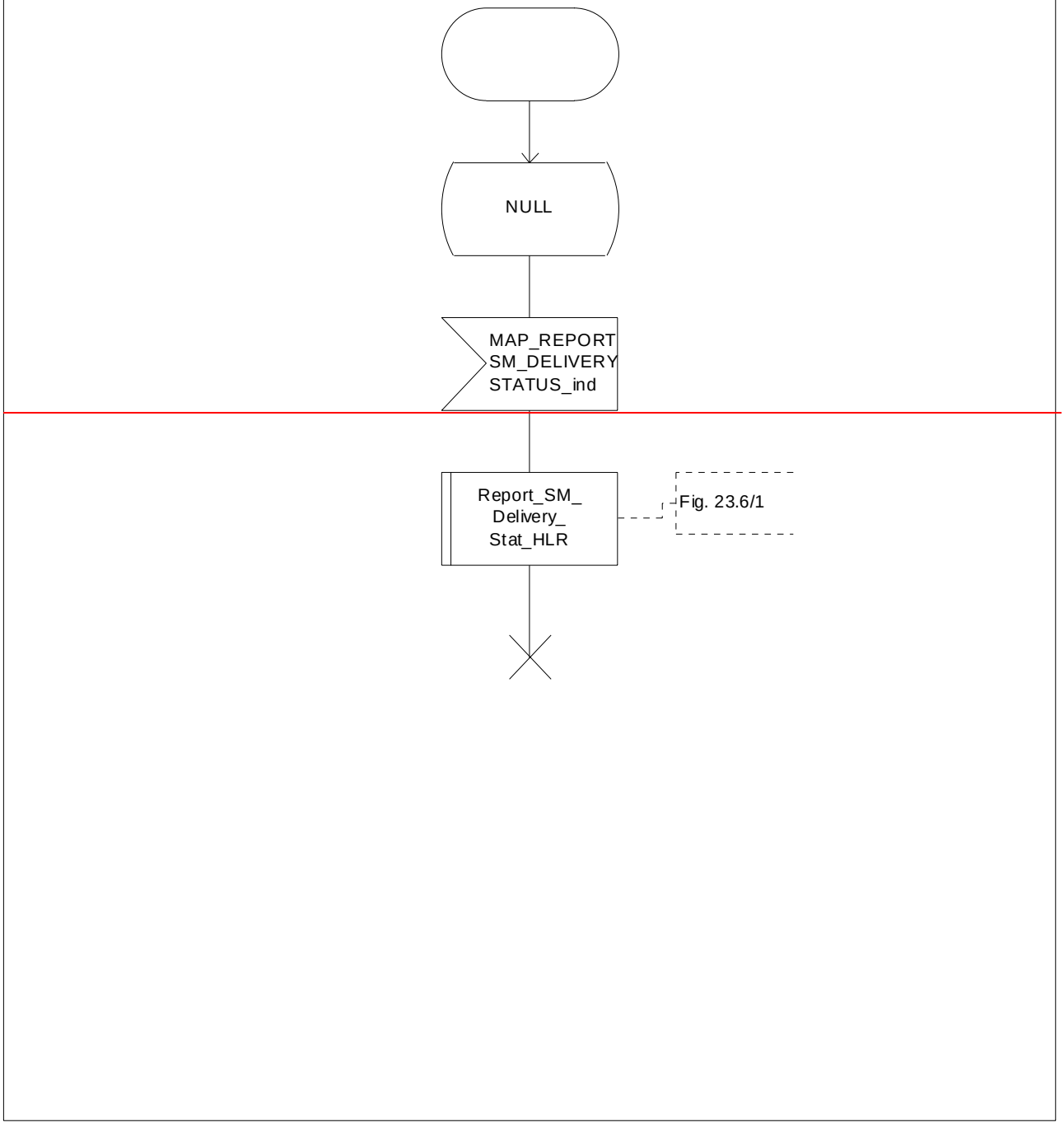
23.5.1 Procedures in the HLR

When the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it acts as described in the subclause 23.6, macro Report_SM_Delivery_Stat_HLR.

The short message delivery status report process in the HLR is shown in figure 23.5/2.

Process SM_Delivery_Status_Report_HLR 23.5_2(1)

Figure 23.5/2: The report SM delivery process in the HLR



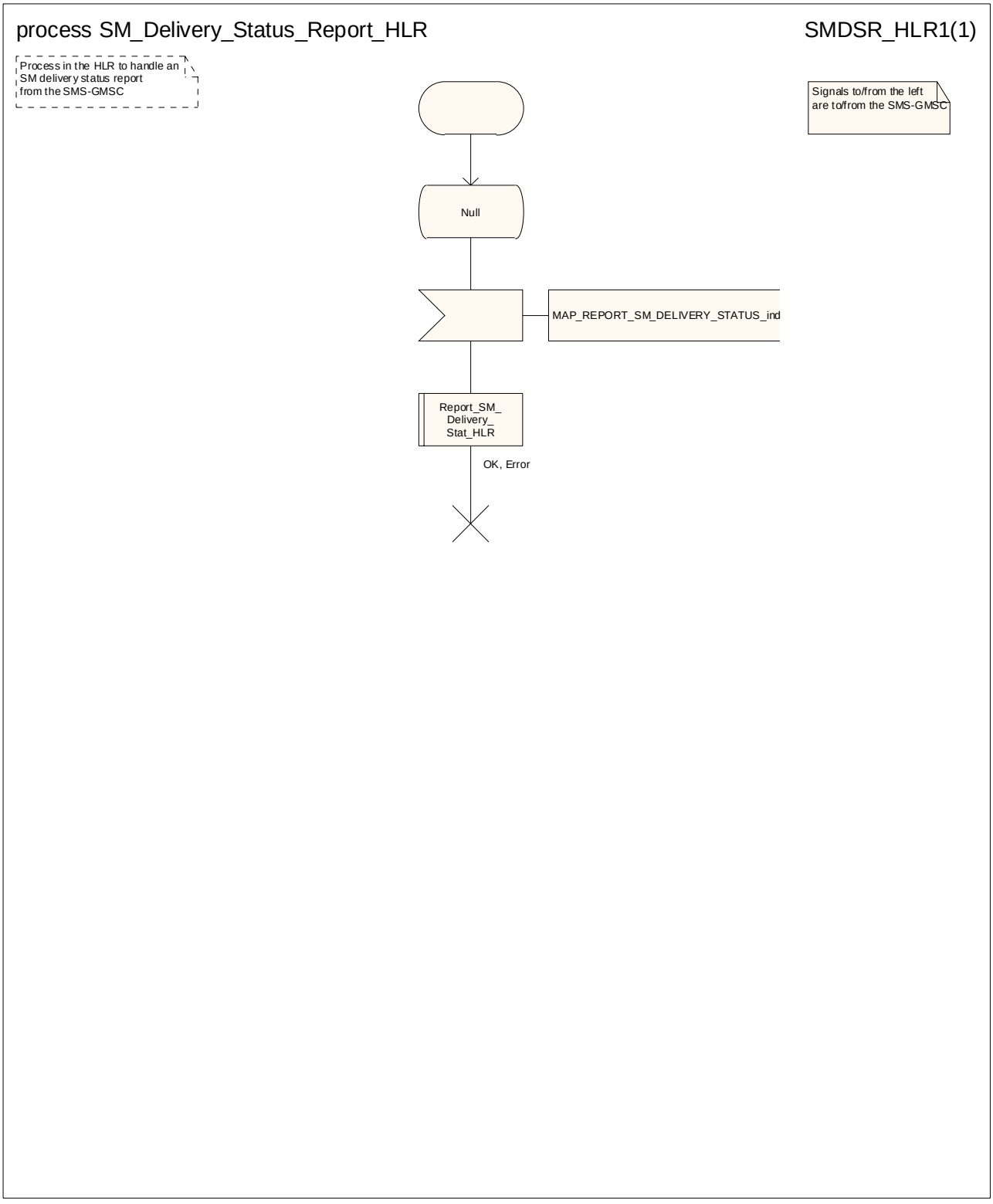


Figure 23.5/2: Process SM_Delivery_Status_Report_HLR

23.5.2 Procedures in the gateway SMS-GMSC

The conditions for the GMSC to invokes the short message delivery status report procedure are specified in subclause 23.3.1.if an absent subscriber_SM indication, unidentified subscriber indication, SM delivery failure error indicating MS memory capacity exceeded or both are received from the servicing MSC, SGSN or both during a mobile terminated short message transfer, and the HLR has not indicated that the SC address is included in the MWD. The unidentified subscriber indication is however processed as the absent subscriber_SM indication.

In case of successful SMS delivery on the second path, the successful SMS Delivery outcome is sent in combination with the unsuccessful SMS Delivery outcome to the HLR.

The service is invoked also when the HLR has indicated that either of the flags MCEF, MNRF or both are set and the first SM delivery was successful from the servicing MSC or, in case of subsequent SM, the last SM delivery was successful from the servicing MSC.

The service is invoked also when the HLR has indicated that either of the flags MCEF, MNRF or both are set and the SM delivery was successful from the servicing SGSN or, in case of subsequent SM, the last SM delivery was successful from the servicing SGSN.

The SMS-GMSC requests a MAP dialogue and sends a MAP_REPORT_SM_DELIVERY_STATUS request to the HLR containing the subscriber data of the mobile subscriber.

- if the macro Receive_Open_Cnf takes the "Error" exit, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;
- if the macro Receive_Open_Cnf takes the "V1" exit, the SMS-GMSC checks the delivery result.
  - if delivery was successful, or delivery failed with any reason other than "Absent subscriber", the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;
  - if delivery failed with a reason of "Absent subscriber", the SMS-GMSC handles the dialogue according to the specification for the earlier version 1 of the protocol, and the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit;
- if the macro Receive_Open_Cnf takes the "Vr" exit (for a version greater than 1), the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol, and the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit;
- if the macro Receive_Open_Cnf takes the "OK" exit, the SMS-GMSC waits for a response from the HLR.

When the SMS-GMSC is waiting for a response from the HLR:

- if the dialogue with the HLR fails, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;
- if it receives a MAP_REPORT_SM_DELIVERY_STATUS confirmation, it checks the confirmation.
  - if the confirmation contains an error, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;
  - if the confirmation indicates a successful result, the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit.

The reason for unsuccessful, successful for GPRS, non GPRS or both deliveries of the short message are included in the SM Delivery Outcome inIf delivery was successful, the MAP_REPORT_SM_DELIVERY_STATUS request indicates whether delivery succeeded for GPRS or non-GPRS.

In the case of an If delivery was unsuccessful delivery due tobecause the subscriber being was absent, the absent subscriber diagnostic indication (if available) is also included in the MAP_REPORT_SM_DELIVERY_STATUS request includes the absent subscriber diagnostic indication (if available).

If the reason for unsuccessful delivery is absent subscriber with diagnostic 'Paging failure' for GPRS or non GPRS, the MAP_REPORT_SM_DELIVERY_STATUS request includes the two SM Delivery Outcomes absent subscriber with both diagnostics 'Paging failure' for GPRS and non- GPRS. is included in the MAP_REPORT_SM_DELIVERY_STATUS request.

The GMSC sends the MAP_REPORT_SM_DELIVERY_STATUS request to the HLR. As a response the GMSC will receive the MAP_REPORT_SM_DELIVERY_STATUS confirmation reporting:

- successful outcome of the procedure. The acknowledge primitive may contain the MSISDN-Alert number which is stored in the MWD List in the HLR;

- unsuccessful outcome of the procedure. The system failure indication is forwarded to the SC. In that case, if the SM Delivery Outcome was successful SMS delivery for GPRS or non GPRS (combined or not with another unsuccessful reason), a successful report is forwarded to the SC.

A provider error is indicated as a system failure to the SC.

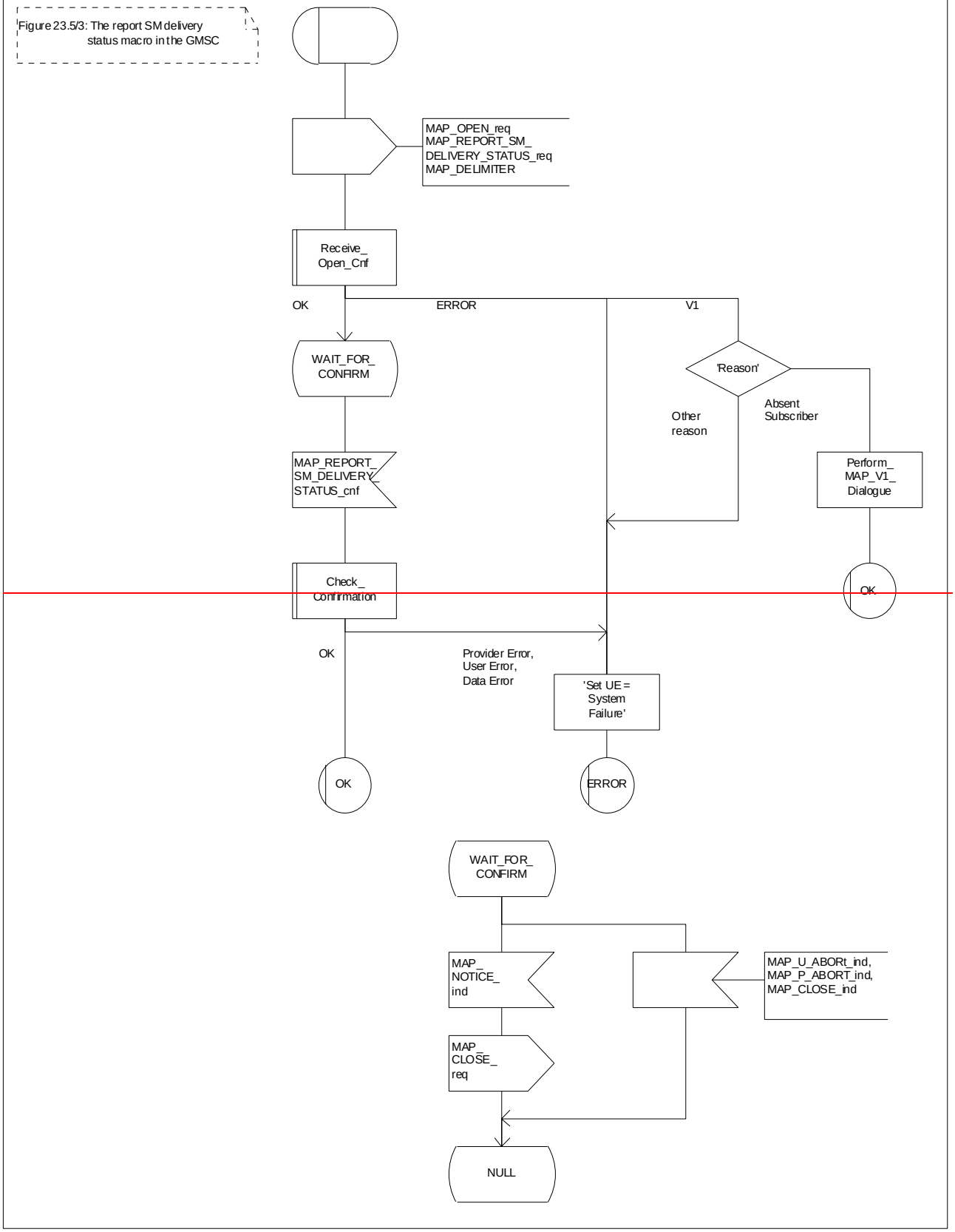
Note that the indication, of which number belongs the SGSN and which to the MSC, received from the HLR at in the routing information result (see subclause 23.3.23) will enable the GMSC to map the causes received from the SGSN, MSC or both into the appropriate causes for GPRS, non-GPRS or both, and send them to the SC and HLR.

The procedure towardsdialogue with the Service Centre may also be aborted. If so the SMS-GMSC aborts the operation towardsdialogue with the HLR is also aborted.

The short message delivery status report procedure macro in the SMS-GMSC is shown in figure 23.5/3.

Macrodefinition Report_SM_Delivery_Stat_GMSC 23.5_3(1)

Figure 23.5/3: The report SM delivery status macro in the GMSC



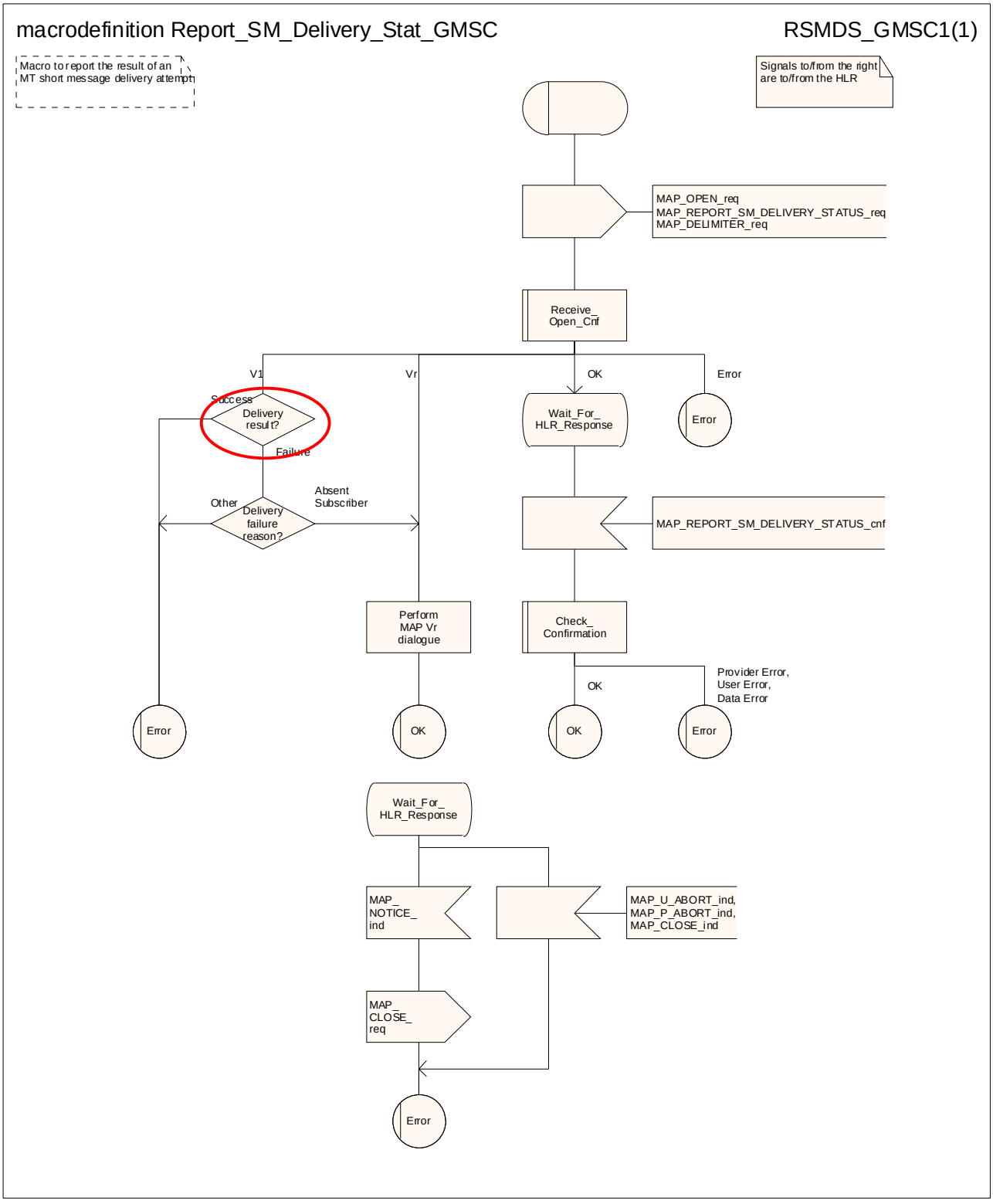


Figure 23.5/3: Macro Report_SM_Delivery_Stat_GMSC

23.6 ~~Common procedures for the short message clause~~The macro Report_SM_Delivery_Stat_HLR

~~23.6.1 The macro Report_SM_Delivery_Stat_HLR~~

This macro is ~~used~~ invoked when the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication from the SMS-GMSC. The HLR ~~responses to~~handles the indication as follows:

- if the indication is badly formed, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the appropriate User Error, and the macro takes the "Error" exit;
- if there is no record in the HLR for the subscriber, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the User Error "Unknown subscriber", and the macro takes the "Error" exit;
- if the MAP_REPORT_SM_DELIVERY_STATUS indication did not include the GPRS support indicator, the HLR deduces the domain for which the delivery report applies as follows:
  - if the subscriber is a GPRS-only subscriber, the report applies for GPRS;
  - if the subscriber is a non-GPRS-only subscriber, the report applies for non-GPRS;
  - if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the SGSN", the report applies for GPRS;
  - if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the MSC", the report applies for non-GPRS;
- if the MAP_REPORT_SM_DELIVERY_STATUS indication indicated delivery failure, the HLR attempts to add the SC address to the MWD list.
  - if the update of the MWD list failed, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the User Error "MWD list full", and the macro takes the "Error" exit;
  - if the update of the MWD list succeeded, the HLR sets the variable Delivery Result to Failure, and continues to process the delivery failure report:
    - if the MSISDN used to define the destination MS was not the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_REPORT_SM_DELIVERY_STATUS response;
    - if the delivery failure cause was MS memory capacity exceeded for non-GPRS, the HLR sets the MCEF and clears the MNRF;
    - if the delivery failure cause was MS memory capacity exceeded for GPRS, the HLR sets the MCEF and clears the MNRG flag;
    - if the delivery failure cause was Absent Subcriber for non-GPRS, the HLR sets the MNRF;
    - if the delivery failure cause was Absent Subcriber for GPRS, the HLR sets the MNRG flag;
    - if the delivery failure cause was Absent Subcriber for non-GPRS and GPRS, the HLR sets the MNRF and the MNRG flag;
    - if the delivery cause was absent subscriber and the MAP_REPORT_SM_DELIVERY_STATUS indication included a reason for absence, the HLR stores the reason for absence in the Mobile Not Reachable Reason and calls the procedure Check_Absent_Subscriber_SM_In_HLR (~~9~~see 3GPP TS 23.116 [110];
    - the HLR returna a MAP_REPORT_SM_DELIVERY_STATUS response indicating success, and the macro takes the "OK" exit.
- if the MAP_REPORT_SM_DELIVERY_STATUS indication indicated successful transfer,the HLR handles the indication as follows:

- if the delivery outcome was for non-GPRS, the HLR clears the MNRF and the MCEF;
- if the delivery outcome was for GPRS, the HLR clears the MNRG flag and the MCEF;
- the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response indicating success;
- the HLR invokes the macro Alert_Service_Centre_HLR to alert the service centres whose addresses are in the MWD list, as described in subclause 25.10;
- the HLR sets the variable Delivery Result to Success, and the macro takes the "OK" exit.

~~- if the flag « GPRS Support Indicator » is absent then if the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only, the HLR shall interpret the delivery outcome as a GPRS delivery outcome.~~

~~- if invalid data content is detected, an unexpected data value error or a data missing error is returned to the GMSC;~~

~~- if the MSISDN number provided is not recognised by the HLR, an unknown subscriber error is returned to the GMSC;~~

~~- if the MAP_REPORT_SM_DELIVERY_STATUS indication reports a successful SM delivery, the Service Centres in the Message Waiting list are alerted as described in the clause 25.10;~~

~~- if the SM Delivery Outcome reports unsuccessful delivery and the inclusion of the SC address in the MWD is not possible, a message waiting list full error is returned to the GMSC;~~

~~- if the SM Delivery Outcome reports unsuccessful delivery and the message waiting list is not full, the given Service Centre address is inserted and an acknowledgement is sent to the GMSC. If the MSISDN-Alert stored in the subscriber data is not the same as that received in the MAP_REPORT_SM_DELIVERY_STATUS indication, the MSISDN-Alert is sent in a response primitive to the GMSC;~~

~~- The SC address is only stored in the MWD if the unsuccessful SM Delivery Outcome is not received in combination with another successful SM Delivery Outcome~~

~~- if the SM Delivery Outcome is MS memory capacity exceeded for non GPRS, the HLR sets the memory capacity exceeded flag in the subscriber data and resets the MNRF;~~

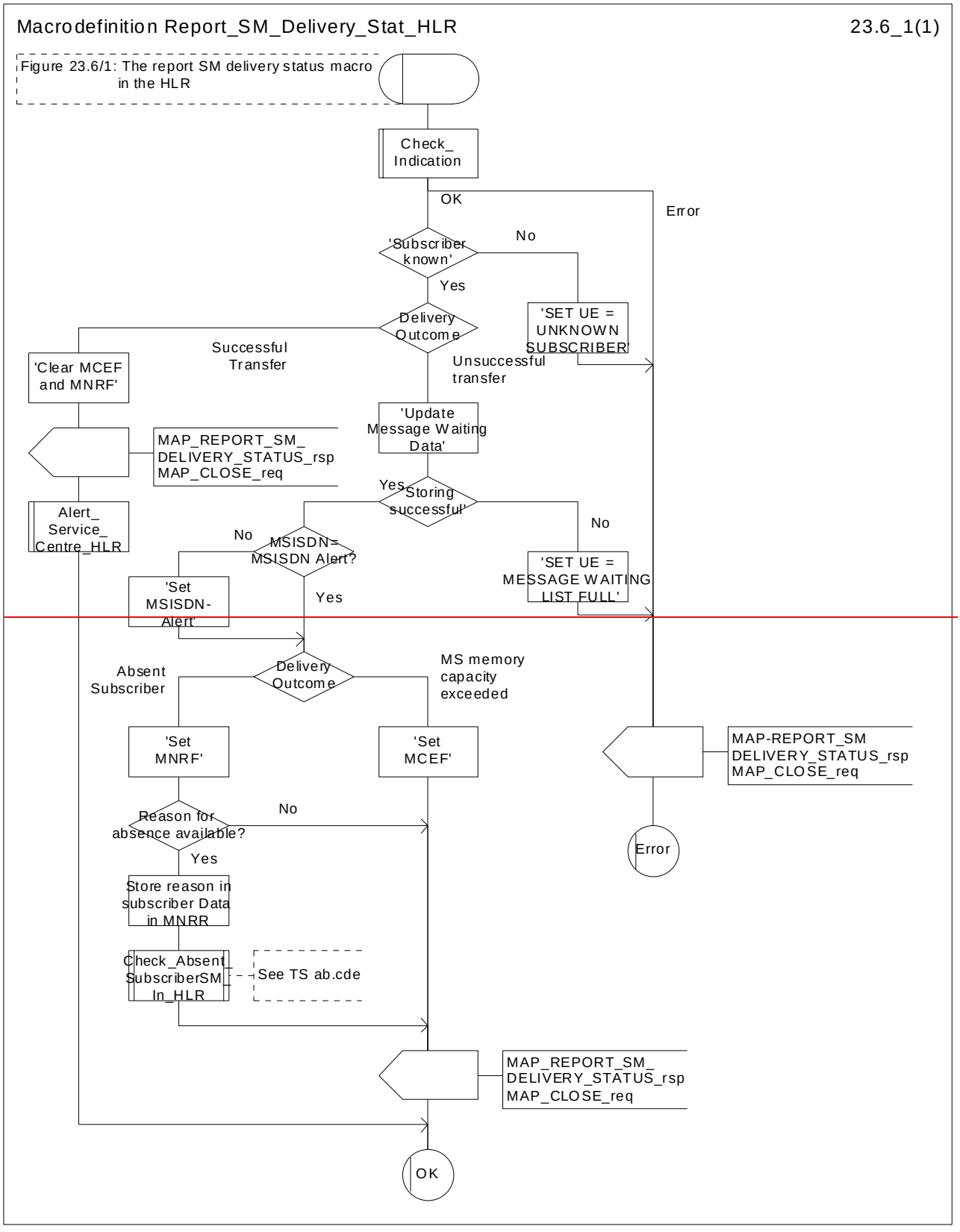
~~- if the SM Delivery Outcome is MS memory capacity exceeded for GPRS the HLR sets the memory capacity exceeded flag in the subscriber data and resets the MNRG;~~

~~- if the SM Delivery Outcome is absent subscriber for non GPRS, the HLR sets the mobile station not reachable flag in the subscriber data. If a reason for absence is provided by the GMSC then this is stored in the mobile station not reachable reason (MNRR) in the subscriber data.~~

~~- if the SM Delivery Outcome is absent subscriber for GPRS, the HLR sets the mobile station not reachable for GPRS flag in the subscriber data. If a reason for absence is provided by the GMSC then this is stored in the mobile station not reachable reason (MNRR) in the subscriber data.~~

~~Note that a combination of all the SM Delivery Outcome specified above may be provided to the HLR from the SMS-GMSC.~~

The short message delivery status report macro in the HLR is shown in figure 23.6/1.


Macrodefinition Report_SM_Delivery_Stat_HLR
23.6_1(1)
Figure 23.6/1: The report SM delivery status macro in the HLR
Check_ Indication
OK
Error
'Subscriber known'
No
Yes
Delivery Outcome
'SET UE = UNKNOWN SUBSCRIBER'
Successful Transfer
Unsuccessful transfer
'Clear MCEF and MNRF'
'Update Message Waiting Data'
MAP_REPORT_SM_ DELIVERY_STATUS_rsp MAP_CLOSE_req
Yes
'Storing successful'
No
Alert_ Service_ Centre_HLR
No
MSISDN= MSISDN Alert?
'SET UE = MESSAGE WAITING LIST FULL'
'Set MSISDN-Alert'
Yes
Absent Subscriber
Delivery Outcome
MS memory capacity exceeded
'Set MNRF'
'Set MCEF'
MAP-REPORT_SM DELIVERY_STATUS_rsp MAP_CLOSE_req
Reason for absence available?
No
Error
Yes
Store reason in subscriber Data in MNRR
Check_Absent_ SubscriberSM_ In_HLR
See TS ab.cde
MAP_REPORT_SM_ DELIVERY_STATUS_rsp MAP_CLOSE_req
OK

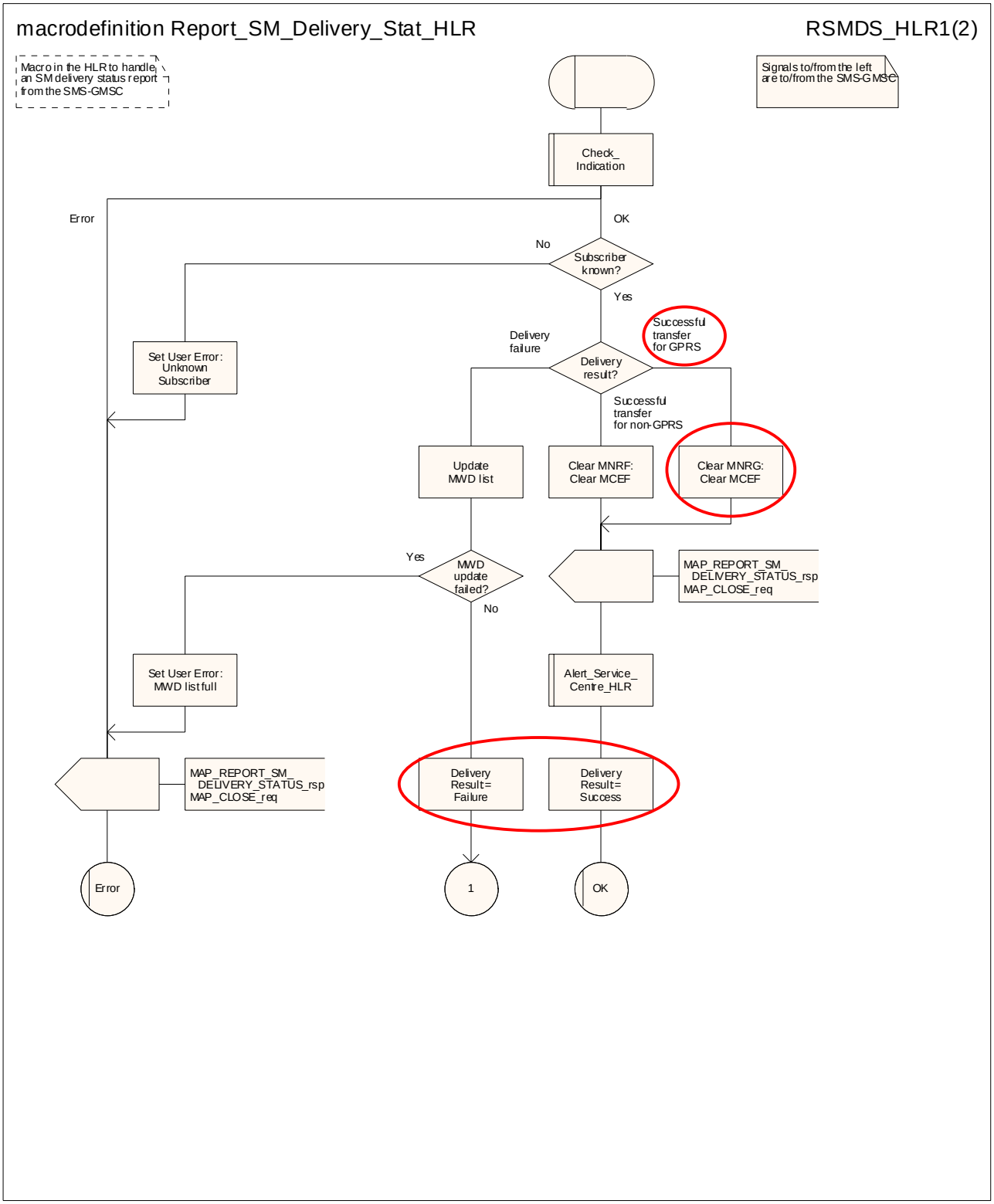


Figure 23.6/1 (sheet 1 of 2): Macro Report_SM_Delivery_Stat_HLR

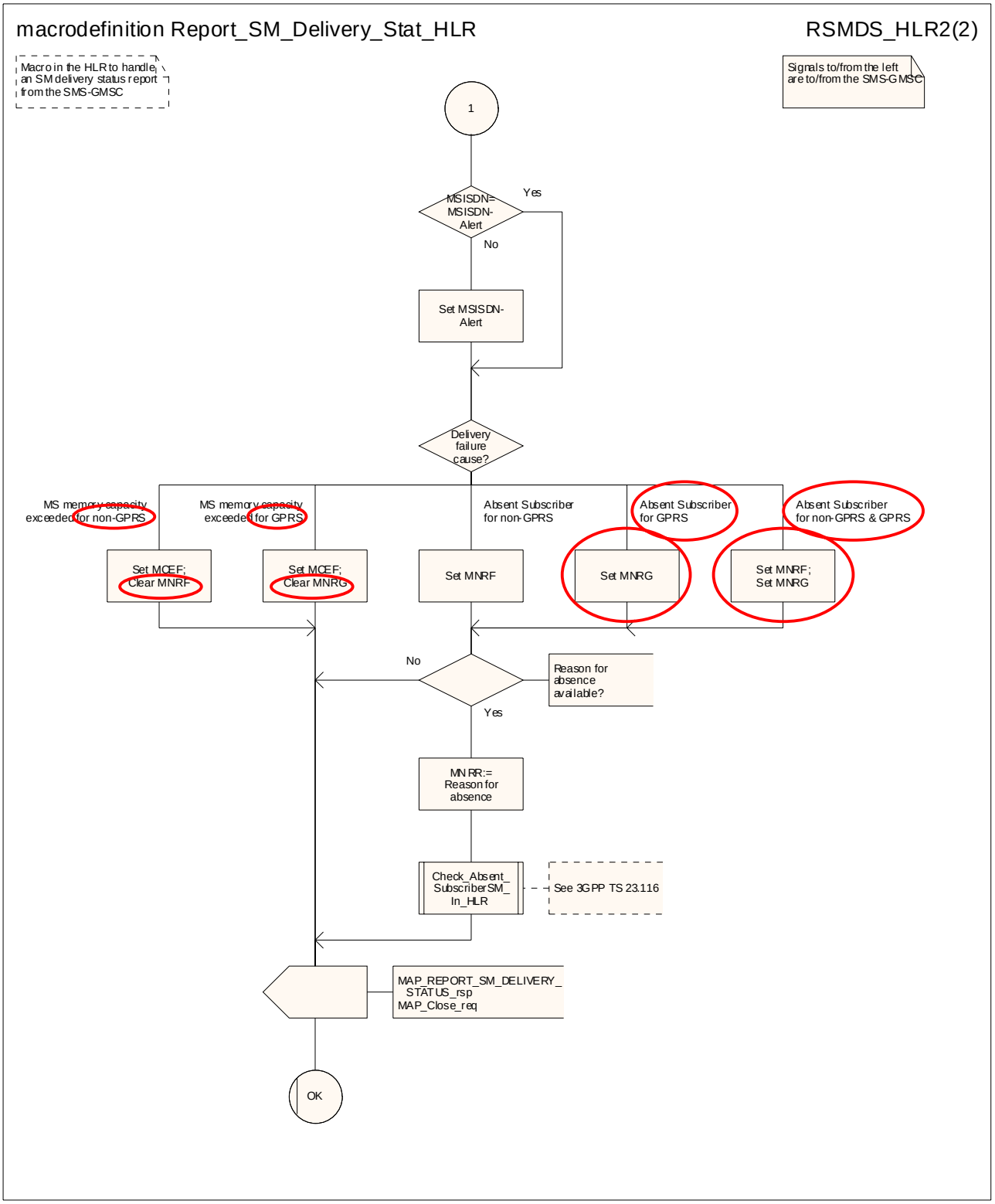


Figure 23.6/1 (sheet 2 of 2): Macro Report_SM_Delivery_Stat_HLR

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